

09/868,640 PTO-892

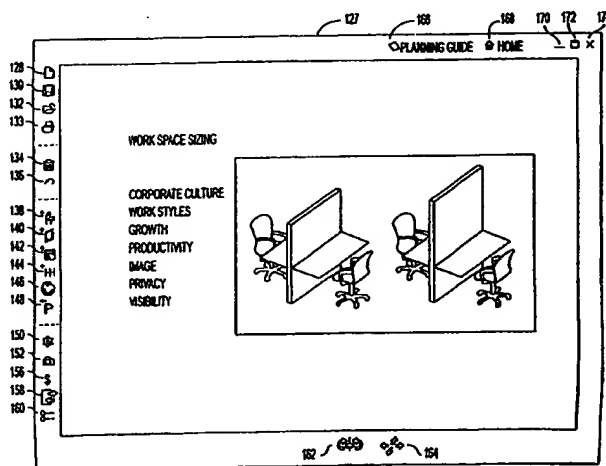


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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : G06F 17/50, G06T 17/40, G06F 17/60		A1	(11) International Publication Number: WO 98/55949
			(43) International Publication Date: 10 December 1998 (10.12.98)
(21) International Application Number: PCT/US98/09890		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).	
(22) International Filing Date: 20 May 1998 (20.05.98)		Published <i>With international search report.</i>	
(30) Priority Data: 08/870,681 6 June 1997 (06.06.97) US			
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(54) Title: **GRAPHICAL USER INTERFACE SUPPORTING METHOD AND SYSTEM FOR REMOTE ORDER GENERATION OF OFFICE FURNITURE PRODUCTS**

(57) Abstract

A graphical user interface to a method and system for configuring office furniture includes interface objects for obtaining configuration criteria from a user; presenting the user with at least one typical configuration satisfying the criteria; selecting a typical configuration from the at least one typical configuration; modifying aspects of the selected typical configuration to produce a modified configuration; and checking the validity of the modified configuration. The configuration criteria include conferencing criteria; privacy criteria; power criteria; communications criteria; storage criteria; and area criteria. A typical configuration can be modified by adding, deleting, or repositioning a component, changing the fabric or finish or the shape or size of the component. A cluster configuration based on the typical configuration is formed. The entire product line can be changed. At any time the entire typical or cluster configuration can be checked for validity and priced.

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GRAPHICAL USER INTERFACE
SUPPORTING METHOD AND SYSTEM FOR REMOTE ORDER
GENERATION OF OFFICE FURNITURE PRODUCTS

5

BACKGROUND OF THE INVENTION

1. Reservation of Copyright

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10 copyright owner has no objection to the facsimile reproduction by anyone of the patent document or the patent disclosure, as it appears in the U.S. Patent and Trademark Office patent files or records, but otherwise reserves all copyrights whatsoever.

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2. Field of Invention

This invention relates to graphical user interface supporting a method and system for enabling the selection and configuration of complex furniture
20 products. More specifically, this invention relates to enabling the selection and configuration of three-dimensional office furnishing products so as to enable remote order generation of valid and acceptable configurations of those products.

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3. Description of Background Information

The sale process for complex products, that is, products that are made up of many interconnected parts, is notoriously difficult, especially when customers are given configuration and product-line choices.

For example, in the office furniture industry, the goal of the sale process is to provide the customer with an acceptable furniture configuration within the customer's price limitations.

From the customer's perspective, an acceptable configuration is one which will provide workspace for their employees within various work-related and space criteria set by the customer. For example, a customer may need to provide, in a given area, sitting work space for a thousand people, where all people have acoustic privacy. A customer's criteria may be complex and often the customer does not really know what they are, other than to know the number of people and the space they will go into.

From the manufacturer's perspective, an acceptable configuration is one which can be manufactured from the manufacturer's product line. That is, an acceptable configuration is a valid, manufacturable configuration of existing component parts.

The sales process is essentially an attempt to reach a convergence on a configuration which is

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acceptable to the customer (meets all space, price and other requirements) and which is acceptable to the manufacturer (is a valid configuration which is manufacturable).

5 An office workspace configuration may comprise thousands of parts drawn from an inventory of millions of possible parts. Each workspace may comprise dividing walls or side panels, work surfaces, storage areas, support structure, electrical structure and the
10 like. Even for a given configuration of workspace, there are various qualitative and quantitative options available. Each part may be available in various qualities and in various colors. Some of the parts may not be compatible with parts from other product lines
15 of the same or other manufacturers. Further, any choice made, even for a single part, may affect the entire configuration.

 A customer wishing to buy a complex product such as office furniture is faced with an incredible number
20 of interdependent choices.

 In the office furniture market at present, a typical sale takes place as follows: A salesperson visits a customer and presents the customer with drawings of some typical configurations of various
25 product lines. The customer selects various options which the salesperson records. At this time all of the

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sale is taking place in terms of individual parts and not in terms of the final product or even in terms of compound components of the final product. In other words, the customer does not buy a collection of
5 workstations, instead he buys a collection of parts.

Once the customer is satisfied with the configuration, the salesperson goes back to the manufacturer who determines whether or not the configuration is actually possible given the current
10 product line. For example, the customer may have put a shelf on a dividing panel without confirming that the panel could actually support such a shelf. Or a panel may be given a size which the manufacturer does not or cannot manufacture. Accordingly, the manufacturer then
15 tries to build the customer's proposed order using a CAD (computer aided design) system and a collection of known parts. Errors in the customer's proposed order are reported and, in some cases, a best attempt at the order is drawn up. From this best attempt produced by
20 the CAD operators, a list of required component parts is obtained and then a price for the entire configuration is determined for all of the component parts.

This process, so far, can take more than two
25 weeks. The sales person then goes back to the customer with the design, as best it could be done, and the

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price for this design. This is the first time that the customer sees his actual order drawn out, and usually in two-dimensions. If there were errors in the design, which there usually are, or if the customer does not
5 like the current design, the process is repeated.

After some number of iterations (that is customer to sales person to CAD operator to pricing and back to the customer via the sales person), the customer is finally presented with an acceptable configuration and
10 a price for that configuration.

In a typical sales scenario this whole order process (i.e., convergence to a configuration which is acceptable to both the customer and the manufacturer) takes six sales calls and design iterations.

15 Even when the customer is satisfied with a configuration and even if it is a valid, manufacturable configuration, there is no simple way for anyone to go back and ask a simple "what if" type of question about the order. For instance, if, in an order for an
20 acceptable configuration, the customer wants to know the effect on price of changing to a different quality panel system, the whole price would have to be redetermined by the manufacturer.

To see why this pricing and configuration process
25 is not simple, consider the change from a high quality panel to a lower quality panel of the otherwise same

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dimensions. Suppose that the panel has a shelf hanging on it and that the high quality panel can support shelves whereas the lower quality panel cannot support shelves without an extra support. So, a supposedly
5 simple question like "What if I use this type of panel instead of that?" can lead to an entire reconfiguration and repricing of the system. Its often not enough to just change the price of the components being used, sometimes the components themselves have to be
10 supplemented. In some cases, changes may not be possible.

Even from a salesperson's perspective, the inability to price "what if" scenarios has major drawbacks. For instance, if a customer is satisfied
15 with a configuration's layout but still thinks that the price is too high, it is desirable for the salesperson to be able to make qualitative changes to the configuration and show what the corresponding price changes would be. In the case of office furnishings, a
20 salesperson would like to be able to show, at the customer's site and at the time of setting up the configuration, the effects on price of various changes. In that way, convergence to an acceptable configuration can be achieved with greater speed.

25 In the general field of product configuration, tools have been developed to aid in selection and

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validation of configurations. One such system is available from Trilogy Development Group of Austin, Texas, and is described in United States Patent No. 5,515,524, "Method and Apparatus for Configuring
5 Systems," to Lynch et al, which is expressly incorporated herein by reference in its entirety.

Lynch describes a constraint based configuration system using a structural model hierarchy. The structural aspects of the model provide the system with
10 the ability to define a model element as being contained in, or by, another model element. The structural model provides the ability to identify logical datatype and physical interconnections between elements and to establish connections between elements.

15 In order to configure a product, Lynch's system accepts input in the form of requests or needs. Using this information, Lynch's system configures a system by identifying the resource and component needs, constraints imposed on or by the resources or
20 components identified, and the structural aspects of the system.

In the specific area of office furniture configuration, attempts have been made to provide customers with simple CAD systems with which to design
25 their configurations. The problems with these systems include that they are difficult to use, they are

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inaccurate, they do not provide the customer with a way to determine whether or not he has a valid, manufacturable configuration (so the customer still has to go back to the manufacturer to have configurations manually checked), and they do not have any knowledge of the manufacturer's product line. Further, no proposed systems are able to prepare a configuration and provide a price for that configuration.

SUMMARY OF THE INVENTION

It is an object of this invention to provide an order generation system, preferably a remote order generation system.

It is a further object of this invention to provide sales people and customers with product configuration systems that are easy to use, accurate, provide the customer with some way to determine whether or not he has a valid, manufacturable configuration (so that the customer does not have to go back to the manufacturer to have configurations checked each time they change), and that has knowledge of the manufacturer's product line. It is a further object of this invention to provide a system that is able to prepare a configuration and that is also able to provide a price for that configuration.

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It is also an object of this invention to provide a system that can have product line and price information added and modified.

5 It is also an object of this invention to provide a system that generates visual specification in two-dimensional (2-D) and three-dimensional (3-D) rendered images.

Accordingly, in one aspect, this invention provides a graphical user interface to a computer
10 program for configuring and ordering office furniture. The user interface presents a user with various selectable options, via display screens on a monitor. Depending upon which options the user selects, the graphical user interface provides the user with
15 information about the product selected or gets input from the user about his requirements.

The user can interact with the order generation program via the user interface to select a basic configuration of furniture, modify the configuration,
20 create a cluster derived from the basic configuration. At all times the user is able to ensure that the current configuration is valid (i.e., manufacturable and/or within the product line) and the user is able to obtain price information about the configuration.

25 The system takes as input user criteria such as conferencing criteria; privacy criteria; power

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criteria; communications criteria; storage criteria;
and area criteria.

5 The user, via the user interface, can modify a
configuration by adding, deleting or moving components
in the configuration or by changing the size or shape
of a component of the configuration. When the shape or
size of a component is adjusted, it can only be changed
to a valid shape or size, thereby maintaining the
integrity of the displayed furniture configuration.

10 Generally, at any stage of the furniture
configuration, the user is able to obtain a realistic
display of the configuration and is then able to view
that display from arbitrary view points.

15 Thus, in one aspect, this invention is a graphical
user interface, a method for using the graphical user
interface, or a method of configuring office furniture.
In another aspect, this invention is computer-readable
media tangibly embodying an interface program of
instructions executable by the machine to provide a
20 graphical user interface to a computer program for
configuring office furniture.

BRIEF DESCRIPTION OF THE DRAWINGS

25 The above and other objects, features, and
advantages of the present invention are further
described in the detailed description which follows,

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with reference to the drawings by way of non-limiting
exemplary embodiments of the present invention, wherein
like reference numerals represent similar parts of the
present invention throughout the several views and
wherein:

FIGURE 1 depicts a typical computer system on which
the order generator of this invention operates;

FIGURE 2 shows the architecture of a preferred
embodiment of the order generator according to this
invention;

FIGURE 3 shows the architecture of an alternative
preferred embodiment of the order generator according
to this invention;

FIGURE 4 is a flowchart of the operation, from a
user's perspective, of the order generator of the
present invention; and

FIGURES 5-15 depict various interface displays of
the order generator of the present invention during its
operation.

DETAILED DESCRIPTION OF THE PRESENTLY PREFERRED EXEMPLARY EMBODIMENTS

This invention operates on a typical computer
system 100 such as shown in FIGURE 1. The computer
system 100 includes various input devices 102 such as a
keyboard, as well as a pointer device 104. A mouse,

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track ball, touch screen, keyboard cursor control keys or the like can be employed as the pointer device 104. The computer system 100 also includes a processor such as CPU 106 and internal memory 108. The processor 106
5 may be a special purpose processor with image processing capabilities or it may be a general purpose processor. The memory 108 may comprise various types of memory, including RAM, ROM, and the like. The computer system 100 also includes external storage 112
10 which includes devices such as disks, CD ROMs, ASICs, external RAM, external ROM and the like.

The present invention can be implemented as part of the processor 106 or as a program residing in memory 108 (and external storage 112) and running on processor
15 106, or as a combination of program and specialized hardware. When in memory 108 and/or external storage 112, the program can be in a RAM, a ROM, an internal or external disk, a CD ROM, an ASIC or the like. In general, when implemented as a program or in part as a
20 program, the program can be encoded on any computer-readable medium or combination of computer-readable media, including but not limited to a RAM, a ROM, a disk, an ASIC, a PROM and the like.

The computer system 100 also includes a display
25 110 and, optionally, an output device such as a printer 113.

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The computer system 100 can run any operating system.

In preferred embodiments, the computer system 100 is an IBM PC compatible notebook computer configured with a Pentium 90 (or above) CPU (for processor 106) and, (for memory 108) a minimum of sixteen Mbytes RAM, a CD drive and a hard drive with 840 Mbytes, with approximately thirty Mbytes of free disk space (for external storage 112). The computer system 100 preferably runs Microsoft Windows 95 as its operating system.

The preferred display 110 is an 800 x 600 active color matrix display with sixteen-bit color. The preferred printer 112 is at least an ink jet color printer.

While the preferred computer system is a stand-alone system, in other embodiments the computer system 100 is connectable to a network of computers so that some or all of its processing functions, for example, for complex tasks, can be off loaded to other computers on the network. In network environments some or all of the data may reside at remote locations.

The architecture of a preferred embodiment of the order generator is shown in FIGURE 2 wherein the order generator 114 uses a modelling tool 116 connected to a custom user interface 118. Both the modelling tool 116

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and the custom user interface 118 access (read and/or write) various databases, including a product attribute database 120. The user interface 118 also accesses a meta file 121 which it uses to share data through a symbol library 123 with a CAD package 124.

The modelling tool 116 takes as input various user configuration specifications via the custom user interface 118, verifies their validity and determines their pricing. This information can be passed back to the custom user interface 118 or it can be used by a project specifier 122, in conjunction with the CAD package 124, to produce an actual order 125. The project specifier 122 also takes input from a product catalog 129 in order to produce the actual order 125.

In one aspect, the custom user interface 118 operates as a front-end to the modelling tool 116, providing it with user requirements, user specified furniture configurations and other information and obtaining from it configuration information including whether or not a configuration is valid and the price of the configuration.

Preferably the modelling tool 116 is one which uses a generative approach for configuring systems. Such a system is available from Trilogy Development Group of Austin, Texas, and is described in United States Patent No. 5,515,524, "Method and Apparatus for

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Configuring Systems," to Lynch et al, already incorporated by reference herein in its entirety.

Lynch's system, in order to configure a product, accepts input in the form of requests or needs. Using this information, Lynch's system configures a system by identifying the resource and component needs, constraints imposed on or by the resources or components identified, and the structural aspects of the system.

Thus, in the present invention, the modelling tool 116 is programmed to configure office furniture systems by identifying the component needs, resources, and constraints imposed on or by the resources or components identified, and the structural aspects of the system. For example, a particular storage requirement may require a certain type of panel. If a user requires that type of storage then the appropriate type of panel must be used.

The model can handle both configuration and checking functions. In the preferred embodiment, three-dimensional objects and their topological relationships are modelled. The attributes modeled include, but are not limited to:

size (x, y, z dimensions);
color;
texture;

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finish (fabric/direction, wood/direction,
laminated, glass, metal);
obsolescence;
power (electric); and
5 weight.

The modelling system 116 can connect workstations,
recognize and fix common walls, resolve component
duplication and overlap, indicate obstacles and resolve
power connectivity. For example, with regard to panel
10 connectivity, angles are confined to a limited number
of fixed positions. As to common walls, from a two-
dimensional representation of a layout, the system
ensures that the correct number of parts is calculated.

The modelling system 116 bases its determinations
15 on the input user requirements and on information in
the product attribute database. It also uses a model
of the inter-relationships between the various
components. An example of such a model is shown in the
tables appearing at the end of this specification.

20 In an alternate embodiment of the order generation
system 115, as shown in FIGURE 3, the functions of the
project specifier are incorporated into the modelling
tool 116 and there is tight coupling of the modelling
tool to a CAD program. In this embodiment of the order
25 generation system 115, there are two integrated

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interfaces to the modelling tool 116, namely a custom user interface 124 and a custom design interface 126.

System Operation

5 The operation of the order generation system 114, particularly the custom user interface 118, on computer system 100 is now described with reference to FIGURES 1-15. The custom user interface 124 of the alternative embodiment 115 shown in FIGURE 3 operates in the same
10 manner.

 When the order generation system 114 begins running on computer system 100, the user is presented with a start screen on the display 110 of computer system 100 (at P100 in FIGURE 4). The start screen
15 presents the user with various user selectable options. The options are presented as demarcated text areas or as icons on the screen depicted on the display 110 of the computer system 100. Each presented option can be
20 selected with the pointer device 104 or using one or more keys on the keyboard 102. An option is selected in a known manner such as by clicking the pointer device 104 on the area of the screen on which the option is displayed.

 When an option is selected, the custom user
25 interface 118, running on computer system 100, determines which option has been selected and then

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either processes the option or effects processing of that option. For example, some options are processed entirely within the user interface 118 itself, whereas others require processing by other components of the system 114, in particular by the modelling tool 116.

Generally the custom user interface 118 keeps track of user information at a project level. For each project the custom user interface 118 gets information from the user and then tracks and stores that information as needed. The information is tracked and stored in a manner known in the art such as in a data structure or database which can be accessed as needed. When the user interface 118 requires information regarding product attributes, it obtains that information from the product attribute database 120. When, as the result of some implicit or explicit user request, the user interface 118 requires some processing to be performed by the modelling tool 116, the user interface 118 invokes the appropriate functionality of the modelling tool 116 and gives the modelling tool 116 whatever data is needed. For example, if, as will be described below, the user requests, via the user interface 118, that the modelling tool 116 check the validity of a furniture configuration, then the user interface 118 will pass to the modelling tool 116 the appropriate data

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representing the current configuration. Using the data it receives about the configuration from the user interface 118, along with whatever information it needs from the product attribute database 120, along with the model of the system, the modelling system will then, as requested, check the configuration of the configuration. The result of the configuration check by the modelling tool 116 is not simply a binary "valid" or "invalid" result, but, when possible, is a valid configuration. Thus, the modelling tool 116 is able to pass back configuration data to the user interface 118.

From the start screen presented to the user by the user interface 118, the user is given the option of either loading an existing project (i.e., a project which was previously saved by the order generation system 114) (at P102), or beginning a new project (at P104). If the user selects the option to open an existing project, then the order generation system 114, via the user interface 118, prompts the user for the name under which that project was saved. If the named project can be found, the order generation system 114 retrieves the project and loads it into the system, otherwise the user is prompted for another project name or to start a new project.

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If the user selects the option to create a new project (at P104), then the user is prompted (at P106) to input the needs of the project on a series of planning guide screens. Based on the user's input into
5 the planning guide screens, the order generation system 114 determines which options to present to the user in subsequent display screens.

For example, the user interface 118 compiles or translates the entered user requirements into criteria
10 which both it and the modelling tool 116 can use. Then, when requesting a list of components which meet the user's needs, the user interface and, when necessary, the modelling tool 116, can query the requirements to ensure that they are met.

15 One example of such a use would be if the user's needs included standing privacy and lockable storage space. Then, as described below, when the user requested a list of typical configurations satisfying his needs, those which did not provide standing privacy
20 and lockable storage would be excluded.

The various planning requirements (user needs) for which the user is prompted include, but are not limited to, privacy requirements, storage requirements, conferencing criteria, electrical/computer space and
25 connection requirements, space requirements, budget constraints, lighting requirements and types of use.

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As to privacy options, the user is given the option of specifying the privacy requirements in terms of panel heights or in terms of various types of privacy: "seating privacy", "standing privacy",
5 "acoustic privacy" and the like. If the user selects certain types of privacy, the order generation system 114 translates this selection into a panel height selection. In preferred embodiments the user is presented with images such as shown in FIGURE 5 in order
10 to explain the various privacy options.

Preferably the planning guide consists of a series of forms which are graphically displayed on the screen, each form having a number of options. Once the user selects a particular option, a screen for that option
15 is displayed with questions about the various sub-options. For example, in order to determine the user's storage requirements, the user selects a storage requirements option and is presented with a storage requirements screen. As shown in FIGURE 6, this screen
20 includes pictures of various types of storage along with textual descriptions of the items which can be stored in each kind of storage.

In some embodiments the user is also provided with an optional tour through a virtual showroom. This tour
25 would consist of a multimedia (e.g., Quicktime etc.) tour through a showroom demonstrating the various

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product lines available and various configurations of those products.

Once the user has completed the planning (at P106) or opens an existing project (at P102) the order
5 generation system 114 provides the user with various options described below. In general, navigation in the order generation system 114 is non-modal. That is, any display screen can be reached from any other display screen and user selected instructions or operations (at
10 P108) are performed (at P110), in effect, either by the user interface 118 or by some other part of the order generation system 114 such as the modelling tool 116. Generally, when a user selects an instruction, the order generation system 114 running on computer system
15 100 performs that instruction. Preferably the user interface 118 performs as many functions as it can, passing requests to the modelling tool 116 only as needed.

Thus, as shown in FIGURE 7, each display screen 127
20 includes various user selectable icons (128-174). Preferably, the icons (128-174) are grouped and positioned on the screen 124 according to their type of functionality. For example, icons 128-133 relate to project maintenance (saving and restoring) and printing
25 functions; icons 134 and 136 relate to editing functions; icons 138-160 relate to configuration and

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customization functions; icons 162 and 164 relate to image positioning and moving functions; planning guide icon 166 relates to the planning guide functionality (described above) and the home icon 168 returns the user to the start (or home) display screen. The window control icons 170-174 are used to size and position the display screen 126 on the display 110.

When the user selects (by clicking on it with the pointer device 104) the new project icon 128, then the user is prompted for the name of the new project and a new project is created.

When the user selects the save project icon 130, the order generation system 114 saves the current project to a storage device connected to the computer system 100. The user has the option of changing the name of the project when it is saved.

When the user selects the open project icon 132, the user is prompted for the name of the project to be opened. If the project of that name is found then it is opened and replaces the current project in the order generation system 114.

When the user selects the print icon 133, then the user interface 118 prints the current project.

When the user selects the delete icon 134, then order generation system 114 deletes the current

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selection (on the display). The undo icon 136 is used to undo previous deletions.

The configuration icons 138-148 are now described in greater detail.

5 By selecting the new typical icon 142, the user is able to select a typical workstation configuration which satisfies the user's requirements input in the planning stage (at P106).

10 When the user selects the new typical icon 142 a graphical depiction of various typical workstation configurations 180 is displayed on the screen. Each of these displayed typical configurations should satisfy some of the user's requirements, at least with regard to privacy, work area and electrical connectivity.

15 Price and space requirements cannot always be satisfied until a complete clustered configuration is determined.

The user can select one of the displayed typical workstation configurations by clicking on it with the pointer device 104. The selected typical configuration is highlighted and displayed on the screen (at 182).

20 The system is pre-configured with a number of so-called typical configurations, and preferably the typicals displayed on the typical screen are those which satisfy the customer's criteria entered at the customer needs screen (reached by selecting the planning guide icon 166).

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Once the user has selected the typical configuration that is to be used, the user can then double click with the pointer device 104 on the depiction of that typical in order to view it and
5 operate on it. At that time the order generation system 114 displays a three-dimensional view of the selected typical on the screen on display 110 (FIGURE 8). Preferably the selected typical furniture configuration is displayed with the appropriate colors
10 and textures.

With reference to FIGURE 8, the user can rotate and move the selected depicted typical workstation using the zoom icon 162 and the move icon 164, respectively. The depiction of the workstation can also be moved and
15 rotated using the pointer device positioned on the object and then moved around the screen area. In this way the user can view the workstation from various angles and positions.

Preferably the image is displayed in a selected
20 color and with a selected texture, that is, in the color and texture of the actual product. Selection of color and texture will be described below.

At any time, the typical configuration displayed on the screen can be modified by the user. This
25 modification can be in the form of adding or removing

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components, changing the shape, size or color of a component or changing the properties of a component.

While viewing a configuration, the user can select product options. In order to pick product options, the user points and clicks the pointer device on the select material icon 148 on the screen 126. This causes the computer 100 to display the various materials screen on the display 110.

The properties screen allows the user to specify a workstation at a detailed level. Every attribute of every part in the workstation can be selected to create a customer's configuration which is then displayed on the screen. The system only allows a user to select valid attributes for each particular component. In that way each displayed configuration is consistent and valid as to its attributes.

In order for the user to resize or reshape components, as shown in FIGURE 9, the user selects the component 182 to be changed using the pointing device 104. When this is done, the selected component becomes highlighted on the screen and arrows (184-192) are shown to depict the various directions in which the part can be resized. The selected part 182 can also be repositioned at another location.

The order generation system 114 will only allow components to be resized or reshaped to valid shapes.

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To ensure this requirement, the user interface 118 checks each resize and reshape operation, while it is ongoing, using the product attribute database 120. However, components can be moved to temporarily invalid locations. As described below, if a component is moved, the configuration will have to be checked and may have to be changed.

In the example shown in FIGURE 9, after the user has resized the component, the support 189 is too long. When the user selects the configuration option 150, the graphical user interface 118 invokes the modelling tool 116 which will replace the support 189 with one of the correct length.

The user can apply fabric and finishes to a typical product by selecting the select material icon 146 with the pointer 104. This enables the user to change all fabric and finish options on each individual component or on all components. When the user selects the select material icon 146, order generation system 114 presents the user with fabric color and finish options on the screen as shown in FIGURE 10. The order generation system 114 will only allow the user to change fabric or finish to valid (manufacturable components in the product line) options for the current components. In this way, the configuration depicted on the screen is always valid with respect to its fabric

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and finish. In order for the user to change a fabric or color, the user selects the appropriate option from those shown on the screen. The fabrics/colors are presented in families (three families in the example in
5 FIGURE 10), so that selecting one color for a particular component will change the other parts of that component to the appropriate color from the family.

If, at any time, the user wants to capture an image of the configuration depicted on the screen, the
10 user can select the snapshot icon 152 which causes the rendered image to be enhanced by sharpening and adding depth. These images can then be printed or cut and pasted into other applications.

The user can add components to the depicted
15 typical by selecting the component icon 140 with the pointer device. This causes the order generation system 114 to present the user with a selection of components which can be added to the configuration (FIGURE 10). The selection includes shelves, panels,
20 storage areas and the like. Generally any component from the product line can be added to a configuration.

Once a particular component is selected, the user positions that component on the typical configuration. The order generation system 114 will allow the user to
25 position the component at an invalid location, since it is assumed that the entire configuration will be

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checked, and possibly adjusted, later. Thus, for example, the user is able to put a shelf on a panel that cannot support the shelf. This is acceptable since later the system will be reconfigured to replace
5 the panel with one which can support the shelf. Alternatively, if no supporting panel is available in the product line, the shelf will not be added.

In order to check the validity (that is, if it can be manufactured from the specified product line and is
10 otherwise a valid configuration) of a modified workstation, the user selects the configuration check icon 150 from the screen 126. This causes the order generation system 114 to invoke the checker module which ensures validity of the depicted configuration.
15 Generally, the modelling tool 116 may indicate that the configuration is not feasible, feasible or it may provide various modifications. For example, it may recognize that one component may be split into two or vice versa. It will insert the appropriate support
20 structure to ensure that the configuration can be built.

Once the modelling tool 116 is done with its processing, it returns control to the user.

Once the user is satisfied with a particular
25 typical configuration for a workspace, the user can generate a cluster of those typicals. In order to do

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this the user selects the "cluster" icon 144 from the screen 126. This causes the order generation system 114 to present the user with various clustering options (FIGURE 12). The user can then select one of the
5 displayed clustering options and the order generation system 114 generates the appropriate cluster of the current typical.

In generating a cluster of typicals, the order generation system 114 invokes the modelling tool 116 to
10 ensure that the cluster is feasible. The modelling tool 116 removes redundant structures such as common walls and replaces multiple parts with individual parts if possible. If necessary the modelling tool 116 also checks the typical to ensure that it is a valid
15 configuration.

When done, the modelling tool 116 presents the user with a display of the selected cluster of typicals as shown in FIGURE 13.

The user can add other detached items such as
20 chairs to a configuration. To do this, the user selects the seating selection icon 138 from the screen 126. When this is done the order generation system 114 presents the user with a display of chairs such as shown in FIGURE 14. The user can select one of the
25 depicted chairs and that chair will be placed (freestanding) in the current cluster or typical.

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Once the current typical and/or cluster configuration is acceptable to the user, its price can be determined using the price icon 156. Selecting the price icon 156 causes the order generation system 114
5 to determine the price of the entire configuration and to present it to the user as shown in FIGURE 15. As can be seen from the quote depicted in FIGURE 15, at this time each component item in the configuration is listed and details about that item are given. This quote is
10 for a valid configuration and can be sent directly to the ordering department.

Alternatively, in some embodiments, when a finalized configuration is determined, the quote may be an estimate requiring checking.

15 As noted above, the modelling system 116 bases its determinations on the input user requirements and on information in the product attribute database. It also uses a model of the inter-relationships between the various components. An example of such a model is
20 shown in the following tables.

In the relationship maps below, the properties are coded as follows: "L" = load bearing, "N" = Non-load bearing, "A" = Provides Aft Support, and "G" = Supplies Ground (Floor) Support.

		Attached Credenzas			places_attached_credenza	PLC	4000
					series_950_credenza_file	PLC	4000
		Mobile Units					8000
		Mobile Peds					8000
					premise_mobile_pedestal	PRM	8000
					places_mobile_pedestal	PLC	8000
							8000
		Mobile Tables					8000
					premise_mobile_conference_end_table	PRM	8000
					premise_mobile_teardrop_table	PRM	8000
					places_mobile_conference_end_table	PLC	8000
					places_mobile_keyboard_table	PLC	8000
					places_mobile_machine_table	PLC	8000
					places_mobile_round_table	PLC	8000
					places_mobile_teardrop_table	PLC	8000
							8000
							8000
		Mobile Storage Units					8000
					new_views_mobile_cabinet	PLC	8000
		Stationary Units					9000
		Stationary Peds					9000
					places_stationary_fundamental_pedestal	PLC	9000
					places_stationary_pedestal	PLC	9000
							9000
							9000
		Stationary Tables					9000
					premise_rectangular_table	PRM	9000
					premise_round_table	PRM	9000
					premise_stationary_conference_end_table	PRM	9000
					premise_stationary_teardrop_table	PRM	9000
					places_c_leg_table	PLC	9000
					places_oval_table	PLC	9000
					places_racetrack_table	PLC	9000
					places_rectangular_table	PLC	9000
					places_square_table	PLC	9000
					places_stationary_conference_end_table	PLC	9000
					places_stationary_machine_table	PLC	9000
					places_stationary_round_table	PLC	9000
					places_stationary_teardrop_table	PLC	9000
					places_table_desk	PLC	9000
							9000
							9000
							9000
							9000
		Stationary Vertical Files					9000
		Stationary Lateral Files					9000
					premise_stationary_lateral_file	PRM	9000
					places_stationary_lateral_file	PLC	9000
					series_950_combination_lateral_file	PLC	9000
					series_950_lateral_file	PLC	9000
		Stationary Bookcases					9000
					premise_bookcase	PRM	9000
					places_bookcase	PLC	9000
					series_950_bookcase	PLC	9000
		Stationary Desks					9000
					premise_desk	PRM	9000
					places_desk	PLC	9000
		Stationary Credenzas					9000
					premise_credenza	PRM	9000
					places_stationary_credenza	PLC	9000
		Stationary Wardrobes					9000
					places_wardrobe	PLC	9000
					series_950_wardrobe	PLC	9000
		Stationary Cabinets					9000
					premise_stationary_storage_unit	PRM	9000
					new_views_stationary_cabinet	PLC	9000
					new_views_storage_cabinet	PLC	9000
					places_stationary_storage_unit	PLC	9000
					series_950_storage_cabinet	PLC	9000
		Suspended Units					3000
		Suspended Peds					3000
					places_suspended_fundamental_pedestal	PLC	3000
					places_suspended_pedestal	PLC	3000

						places_conference_end_work_surface	PLC	3000
								3000
						Single Run Conference Ends		3000
								3000
						premise_curved_work_surface	PRM	3000
						premise_teardrop_end_work_surface	PRM	3000
						places_curved_work_surface	PLC	3000
						places_d_shaped_end_work_surface	PLC	3000
						places_teardrop_end_work_surface	PLC	3000
								3000
								3000
						Countertops		3000
						Straight Countertops		3000
								3000
						premise_rectangular_counter_top	PRM	3000
						places_rectangular_counter_top	PLC	3000
						places_wheelchair_reception_counter_top	PLC	3000
								3000
						Corner Countertops		3000
								3000
						places_corner_counter_top	PLC	3000
								3000
						Horizontal Accessories		3000
								3000
						premise_keyboard_holders	PRM	3000
						premise_mouse_pad	PRM	3000
						premise_palm_rest	PRM	3000
						places_carousel	PLC	3000
						places_corner_canopy	PLC	3000
						places_electronic_transition_cover	PLC	3000
						places_keyboard_holders	PLC	3000
						places_make_a_corner	PLC	3000
						places_mouse_pad	PLC	3000
						places_palm_rest	PLC	3000
								3000
								3000
								3000
								3000
								3000
						Table Tops		3000
						Vertical Supports		7000
						Covers		7000
						Finish Covers		7000
								7000
						premise_variable_height_cover	PRM	7000
						places_canopy_finish_post	PLC	7000
						places_electrical_end_cap	PLC	7000
						places_end_of_run_post	PLC	7000
						places_finish_post	PLC	7000
								7000
						places_variable_end_of_run_post	PLC	7000
								7000
								7000
								7000
						Electrical Covers		7000
								7000
						new_views_base_cover_kit	PLC	7000
						places_180_connector_cover	PLC	7000
						places_90_connector_cover	PLC	7000
								7000
								7000
						Connectors		7000
						T-Mount Kit		7000
								7000
						new_views_t_mount_bracket	PLC	7000
						Standard Connectors		7000
								7000
						premise_connector	PRM	7000
						places_hinge	PLC	7000
								7000
						Modesty Panel Supports		7000
								7000
						places_modesty_to_cabinet_bracket	PLC	7000
						places_modesty_to_panel_bracket	PLC	7000
								7000
						Posts		7000
						Upper Posts		7000
						Lower Posts		7000
						Architectural Connections		7000

[illegible]

Relationship Maps (part 1 of 14)

Class Structure	Component Name	Prod Line	Properties	Inherits From	C#	Constraint Relationships	L#	Light Weight Relationships
Environments				N/A			1	"LWC: Environments"
Service Parts				SA\$3			???	
Interdependent Systems				N/A			???	
Casework Systems				\$B\$5			???	
Hanging Units				\$C\$6	1	"Hang Sturf" AND "HU"	1	"LW Hang Sturf"
Hanging Shelves				\$D\$7	Inh		Inh	
	premise shelf	PRM			Inh		Inh	
	places display shelf	PLC			Inh		Inh	
	places media shelf	PLC			Inh		Inh	
	places mini corner shelf	PLC			Inh		Inh	
	places mini end of run shelf	PLC			Inh		Inh	
	places mini straight shelf	PLC			Inh		Inh	
	places monitor shelf	PLC			Inh		Inh	
	places pass through shelf	PLC			Inh		Inh	
	places shelf	PLC			Inh		Inh	
	places shelf with coat rod	PLC			Inh		Inh	
	places hanging lateral file	PLC		\$D\$7	Inh		Inh	
Hanging Lateral Files					Inh		Inh	
Hanging Storage Units				\$D\$7	Inh		Inh	
	premise overhead unit	PRM			Inh		Inh	
	places overhead unit	PLC			Inh		Inh	
	places shelf with flipper door	PLC			Inh		Inh	
Attached Units				\$C\$8	1	If attaching to a member of X_Credenzas or X_Desks, must attach to the "open" front	1	"Set AP Depth" and "Place Storage"
Attached Peds				\$D\$25	1	"AP"	Inh	
	premise attached pedestal	PRM			1	"AP prm-sp"	Inh	
	places attached fundamental pedestal	PLC			Inh		Inh	
	places attached pedestal	PLC			Inh		Inh	
Attached Lateral Files				\$D\$25	1	"ALF"	1	"Place Storage"
	premise attached lateral file	PRM			1	"ALF prm-elf"	Inh	
	places attached lateral file	PLC			Inh		Inh	
Attached Bridges				\$D\$25	1	"AB"	1	"Center on Floor" AND "Attach Bridge/Return"
	premise bridge	PRM			Inh		Inh	
	places bridge	PLC			Inh		Inh	
	places transition bridge	PLC			Inh		Inh	
Attached Cabinets				\$D\$25				
	new views upper unit	PLC		\$E\$37	1	"UAC mv-4u"	???	
Upper Attached Cabinets					???	Must sit on top of ???	???	

Relationship Maps (part 2 of 14)

Class Structure	Component Name	Prod Line	Properties	Inherits From	Constraint Relationships	L#	Light Weight Relationships
Lower Attached Cabinets	premise_attached_storage_unit	PRM		\$E\$37	1 "LAC"	???	
	new_views_lower_unit	PLC			1 "LAC pm-asu"	???	"Center on Floor" and "Set LWC Position Attached Lateral File And Storage Unit"
	pieces_credenza_door_unit	PLC			1 "LAC mv-lu"	1	
					???	???	
Attached Corner Units				\$D\$25	Both sides must attach to a member of Attached Returns/ Bridges/ Credenzas/ Desks	1	"Center on Floor"
	premise_corner_unit	PRM		Inh		Inh	
	premise_wrap_around_unit	PRM		Inh		Inh	
	pieces_corner_unit	PLC		Inh		Inh	
Attached Convergent Units				\$D\$25	1 "AConvU"	1	"Center on Floor"
	premise_convergent_unit	PRM		49		Inh	
	premise_wrap_around_d_unit	PRM				Inh	
	pieces_convergent_unit	PLC				Inh	
Attached Conference End Units				\$D\$25		1	"Center on Floor"
	premise_conference_end_unit	PRM				Inh	
				\$D\$25	1 "ARet"	1	"Center on Floor"
				Inh		Inh	
Attached Returns	premise_return	PRM				Inh	
	pieces_return	PLC		1	If 30" panel used as return, WS must use brackets, not cantilevers	Inh	
	pieces_transition_return	PLC		1	If 30" panel used as return, WS must use brackets, not cantilevers	Inh	
Attached Vertical Storage Units				\$D\$25	1 "AVSU"	1	"Center on Floor"
	premise_vertical_storage_unit	PRM				Inh	
	pieces_vertical_storage_unit	PLC				Inh	
Attached Casework Shelves				\$D\$25		1	LWC: ACS
	premise_bookcase_shelf	PRM			n/a ACCESSORY	n/a	ACCESSORY
	premise_storage_unit_shelf	PRM			n/a ACCESSORY	n/a	ACCESSORY
	pieces_bookcase_shelf	PLC			n/a ACCESSORY	n/a	ACCESSORY
	pieces_storage_unit_shelf	PLC			n/a ACCESSORY	n/a	ACCESSORY
	pieces_wardrobe_shelf	PLC			n/a ACCESSORY	n/a	ACCESSORY
	series_950_bookcase_shelf	PLC			n/a ACCESSORY	n/a	ACCESSORY
	series_950_cabinet_shelf	PLC			n/a ACCESSORY	n/a	ACCESSORY
	series_950_overfile_shelf	PLC			n/a ACCESSORY	n/a	ACCESSORY
					Must attach to a member of X_Corners or X_Decks		
Attached Credenzas				\$D\$25	1 X_Decks	1	"Center on Floor"
	pieces_attached_credenza	PLC		Inh		Inh	
					must sit under workurface, flush to front - exactly the same as Attached Drawer Pedestal (has no top)		
	series_950_credenza_file	PLC				Inh	

Relationship Maps (part 3 of 14)

Class Structure	Component Name	Prod Line	Properties	Inherits From	C#	Constraint Relationships	L#	Light Weight Relationships
Mobile Units								
Mobile Peds								
	premise mobile pedestal	PRM		\$C38	1 Must sit on floor		1	"Center on Floor"
	places mobile pedestal	PLC		\$D374			Inh	
Mobile Tables								
	premise mobile conference end table	PRM		\$D374			Inh	
	premise mobile teardrop table	PRM					Inh	
	places mobile conference end table	PLC					Inh	
	places mobile keyboard table	PLC					Inh	
	places mobile machine table	PLC					Inh	
	places mobile round table	PLC					Inh	
	places mobile teardrop table	PLC					Inh	
Mobile Storage Units								
	new_views_mobile_cabinet	PLC		\$D374			Inh	
Stationary Units								
Stationary Peds								
	places_stationary_fundamental_pedestal	PLC		\$C38	1 Must sit on floor		1	"Center on Floor"
	places_stationary_pedestal	PLC		\$D386			Inh	
Stationary Tables								
	premise_rectangular_table	PRM		\$D386			Inh	
	premise_round_table	PRM					Inh	
	premise_stationary_conference_end_table	PRM					Inh	
	premise_stationary_teardrop_table	PRM					Inh	
	places_c_leg_table	PLC					Inh	
	places_oval_table	PLC					Inh	
	places_rectrack_table	PLC					Inh	
	places_rectangular_table	PLC					Inh	
	places_square_table	PLC					Inh	
	places_stationary_conference_end_table	PLC					Inh	
	places_stationary_machine_table	PLC					Inh	
	places_stationary_round_table	PLC					Inh	

Relationship Maps (part 4 of 14)

Class Structure	Component Name	Prod Line	Properties	Inherits From	Ca	Constraint Relationships	Light Weight Relationships
	placas_stationary_teardrop_table	PLC			???		Inh
	placas_table_desk	PLC			???		Inh
Stationary Vertical Files				\$D\$88			
Stationary Lateral Files				\$D\$88			
	premise_stationary_lateral_file	PRM			???		Inh
	placas_stationary_lateral_file	PLC			???	stands there - is configurable (4 heights) - work like drawer pedestals	Inh
	series_950_combination_lateral_file	PLC				stands there - 23/4/5 high - settable via properties	
Stationary Bookcases				\$D\$88			
	premise_bookcase	PRM			Inh		Inh
	placas_bookcase	PLC			Inh		Inh
	series_890_bookcase	PLC			Inh	23/4/5 high - settable via properties	Inh
Stationary Desks				\$D\$88			
	premise_desk	PRM			???		Inh
	placas_desk	PLC			???		Inh
Stationary Credenzas				\$D\$88			
	premise_credenza	PRM			???		Inh
	placas_stationary_credenza	PLC			???		Inh
Stationary Wardrobes				\$D\$88			
	placas_wardrobe	PLC			???		Inh
	series_950_wardrobe	PLC				Stands there, only 1 size (uses series_950_storage_cabinet_metafle)	Inh
Stationary Cabinets				\$D\$88			
	premise_stationary_storage_unit	PRM			???		Inh
	new_views_stationary_cabinet	PLC			Inh		Inh
	new_views_storage_cabinet	PLC			Inh		Inh
	placas_stationary_storage_unit	PLC			Inh		Inh
	series_950_storage_cabinet	PLC				Stands there - 4 or 5 high - no shelves or 3 shelves	
Suspended Units				\$C\$8			
Suspended Peds				\$D\$132	1	Mounts under WS, Return, Desk, or Credenza - but not a Bridge	1 "Place Storage" AND "LWC: Set SP DepthPos"
	placas_suspended_fundamental_pedestal	PLC			Inh		Inh
	placas_suspended_pedestal	PLC			Inh		Inh
Suspended Drawers				\$D\$132	1	Must Mount to Front Edge of Worksurface	
	premise_pencil_drawer	PRM			Inh		???
	placas_pencil_drawer	PLC			Inh		???
	placas_steel_drawer	PLC			Inh		???
	placas_wood_pencil_drawer	PLC			Inh		???

Relationship Maps (part 6 of 14)

Class Structure	Component Name	Prod Line	Properties	Inherits From	C#	Constraint Relationships	LF	Light Weight Relationships
Casegood Accessories				\$C\$6				
	premise_lateral_file_counterweight	PRM			Dep ACCESSORY		n/a	ACCESSORY (Note: Included with 2-highs)
	premise_vertical_storage_unit_template	PRM			Dep ACCESSORY		n/a	ACCESSORY
	places_flipper_door	PLC			???		???	
	places_lateral_file_counterweight	PRM			Dep ACCESSORY		n/a	ACCESSORY (Note: Included with 2-highs)
	places_tug_a_pod	PLC			Dep ACCESSORY		n/a	ACCESSORY
	places_vertical_storage_unit_retrofit_kit	PLC			n/a ACCESSORY		n/a	ACCESSORY
	places_vertical_storage_unit_template	PLC			n/a ACCESSORY		n/a	ACCESSORY
	series_950_bookcase_top	PLC			Must be the same size as target bookcase		n/a	ACCESSORY
	series_950_counterweight	PLC			n/a ACCESSORY		n/a	ACCESSORY
	series_950_credenza_double_top	PLC			contiguous top for 2 bins of same height and width			
	series_950_credenza_single_top	PLC			used when a CF is in the open			
	series_950_lock_bar	PLC			n/a ACCESSORY		n/a	ACCESSORY
	series_950_storage_coat_rod	PLC			n/a ACCESSORY			
	series_950_storage_media_bar	PLC			n/a ACCESSORY			
Wall Systems				\$B\$5				
Verticals				\$C\$166				
Vertical Bases				\$D\$157				
Mobile Bases				\$E\$166				
Sliders				\$F\$166				
Stationary Bases				\$E\$166				
Beams				\$F\$161				
Privacy Screens				\$F\$161				
Scaffolds				\$F\$161				
Panels				\$G\$165	1	Panels Require Support (Physics Constraint)	1	"LWC: Panels"
Panels				\$G\$165	1	"PRM Panels"		
Panels				\$H\$166	1	"PRM Doors"		
Panels				\$H\$166	Inh		Inh	
Panels				\$H\$166	Inh		Inh	
Panels				\$H\$166	1	"PSP pm+4p"		
Panels				\$G\$165	1	"PLC Panels"		
Panels				\$H\$173	1	Door-Swing must match the direction of the return panel and the hinged side of the door should be towards the supporting panels		
Panels				\$H\$173	1	Must have a return panel >=24" deep that's <=24"		
Panels					1	unloaded standard panel away from hinge	Inh	

Relationship Maps (part 6 of 14)

Class Structure	Component Name	Prod Line	Properties	Inherits From	C#	Constraint Relationships	L#	Light Weight Relationships
	places_double_door	PLC			1	Must have a return panel at each hinge - i.e. 0° away	Inh	
Places Framed Panels						Framed Panels Have Restrictions (Physicals Constraint)		
	places_open_panel	PLC		\$H\$173	1		Inh	
Glazed Panels								
				\$H\$173				
Standard Glazed Panels								
				\$H\$179			Inh	
	places_glazed_panel	PLC						
Gabled Glazed Panels								
	places_glazed_gabled_panel	PLC		\$H\$179			Inh	
bi-que Glazed Panels								
	places_glazed_oblique_panel	PLC		\$H\$179			Inh	
Solid Panels								
				\$H\$173				
Standard Solid Panels								
	places_solid_panel	PLC		\$H\$186			Inh	
Gabled Solid Panels								
	places_gabled_panel	PLC		\$H\$186			Inh	
Oblique Solid Panels								
	places_oblique_panel	PLC		\$H\$186			Inh	
Buttline Solid Panels								
	places_buttline_panel	PLC		\$H\$186	1	If > 10° run with WS, requires corner braces at ends		
Ported Solid Panels							Inh	
	places_ported_panel	PLC		\$H\$186				
Stacked Verticals								
				\$D\$167				
Stack Kits								
				\$E\$197				
Pads								
				\$E\$197				
Extender Screens								
				\$E\$197				
Desk Screens								
				\$E\$197				
Fan Lights								
				\$E\$197	1	"FL"		
Modesty Panels								
	places_fanlight	PLC						
				\$D\$167				
	places_convenient_modesty_panel	PLC						
	places_corner_modesty_panel	PLC						
	places_straight_modesty_panel	PLC						
Vertical Accessories								
				\$D\$167				
	places_blind_tkt	PLC						
	places_counter_top_and_cover	PLC						
	places_electronic_work_surface_and_cover	PLC						

Relationship Maps (part 7 of 14)

Class Structure	Component Name	Prod Line	Properties	Inherits From	C#	Constraint Relationships	L#	Light Weight Relationships
Horizontal Work Surfaces	places_muntin_kit	PLC			1	Must attach to Places Glazed_Panels, matching its size		
	places_walhsoc_kit	PLC			1	Must attach to Places Glazed_Panels, matching its size		
				\$CS168				
			L	\$S\$214		"Hang Surf" AND "Work Surfaces"	1	"Hang Surf"
				\$S\$215		Require "3-corner" support		
				\$F\$216				
Corner Work Surfaces	Height Adjustable Corner Work Surfaces							
	places_height adjustable corner work surface	PLC						
	places_height adjustable split corner work surface	PLC						
	Regular Corner Work Surfaces							
	premise corner work surface	PRM			1	"RCorNWS pmm-ows"		
	premise wrap around work surface	PRM			1	"RCorNWS pmm-waws"		
	places corner work surface	PLC						
Electronic Corner Work Surfaces	places_wrap around work surface	PLC						
						If 2 adjacent electronic WS are separated by 2' gap (i.e. they span a 3-way junction) they need 1 places_electronic_work_surface_transition_cover between them		
				\$F\$218	1			
	places_electronic corner work surface	PLC						
	Transitional Corner Work Surfaces							
	premise transitional wrap around work surface	PRM			1	"TCWS pmm-waws"		
	places transitional corner work surface	PLC						
	places_transitional wrap around work surface	PLC						
	Rectangular Work Surfaces							
Premise Regular Rectangular Work Surfaces	Height Adjustable Rectangular Work Surfaces							
	places_height adjustable rectangular work surface	PLC						
	Regular Rectangular Work Surfaces							
				\$F\$231				
				\$F\$231	1	"RegRectWS"		
				\$G\$234	1	Premise Work Surfaces must have floor support every 6'		
	Premise Regular Rectangular Work Surfaces							
	premise reduced rectangular work surface	PRM			1	"PRRWS pmm-rws"		
	premise rectangular work surface	PRM			1	"PRRWS pmm-rws"		
	premise split rectangular work surface	PRM			1	"PRRWS pmm-srws"		
Places Regular Rectangular Work Surfaces	places_monitor work surface	PLC						
	places_reduced rectangular work surface	PLC						
	places_rectangular work surface	PLC						
	places_rectangular work surface_top	PLC						
	places_split rectangular work surface	PLC						

Relationship Maps (part 8 of 14)

Class Structure	Component Name	Prod Line	Properties	Inherits From	Ch	Constraint Relationships	LA	Light Weight Relationships
	Electronic Rectangular Work Surfaces							
	pieces_electronic_rectangular_work_surface	PLC		\$F\$231	1	If 2 adjacent electronic WS are separated by 2" gap (i.e. they span a 3-way junction) they need 1 places_electronic_work_surface_transition_cover between them		
	Transitional Rectangular Work Surfaces							
	premise_transitional_rectangular_work_surface	PRM		\$F\$231	1	"TRWS prm-rws"		
	places_transitional_rectangular_work_surface	PLC						
	Convergent Work Surfaces							
	Regular Convergent Work Surfaces							
	premise_convergent_work_surface	PRM		\$E\$215	1	If Places, may mount to a panel up to six inches narrower than the convergent (panel run must be => than the width of the convergent)		
	places_convergent_work_surface	PLC		\$F\$250	1	"RConvWS prm-rws"		
	Shaped Convergent Work Surfaces							
	premise_shaped_wrap_around_work_surface	PRM		\$F\$250	1	"RConvWS prm-rws"		
	places_shaped_wrap_around_work_surface	PLC			1	"SCWS prm-rws"		
	Conference Ends							
	Regular Conference Ends							
	premise_conference_end_work_surface	PRM		\$E\$215	1	Attaches to 2 work surfaces with panel between		
	places_conference_end_work_surface	PLC		\$F\$257	1	"RCE prm-rws"		
	Single Run Conference Ends							
	premise_curved_work_surface	PRM		\$F\$257	1	"SRCE prm-rws"		
	premise_teardrop_end_work_surface	PRM			1	"SRCE prm-rws"		
	places_curved_work_surface	PLC						
	places_d_shaped_end_work_surface	PLC						
	places_teardrop_end_work_surface	PLC						
	Countertops							
				\$D\$214		Mounts on top of in-line panel run of uniform (<=3") height longer than the width of the counter top		
	Straight Countertops							
	premise_rectangular_counter_top	PRM		\$E\$257	1			
	places_rectangular_counter_top	PLC						
	places_wheelchair_reception_counter_top	PLC			1	Must be installed over two solid panels: 1) 48" counter over two 24" wide panels, 2) 60" counter over two 36" wide panels		
	Corner Countertops							
	places_corner_counter_top	PLC		\$E\$257	1	"CC prm-rws"		
	Horizontal Accessories							
	premise_keyboard_holders	PRM		\$D\$214				
	premise_mouse_pad	PRM						

Relationship Maps (part 9 of 14)

Class Structure	Component Name	Prod Line	Properties	Inherits From	C#	Constraint Relationships	L#	Light Weight Relationships
	premise_palm_rest	PRM						
	places_carousel	PLC			1	"HA plc-cc"		
	places_corner_canopy	PLC						
	places_electronic_transition_cover	PLC						
	places_keyboard_holders	PLC						
	places_make_a_corner	PLC						
	places_mouse_pad	PLC						
	places_palm_rest	PLC						
Table Tops								
Vertical Supports								
Covers								
Finish Covers								
	premise_variable_height_cover	PRM						
	places_canopy_finish_post	PLC						
	places_electrical_end_cap	PLC						
	places_end_of_run_post	PLC						
	places_finish_post	PLC						
	places_variable_end_of_run_post	PLC						
Electrical Covers								
	new_views_base_cover_kit	PLC			???			
	places_180_connector_cover	PLC						
	places_90_connector_cover	PLC						
Connectors								
					1	Must sit on floor		
T-Mount Kit								
	new_views_t_mount_bracket	PLC			1	Cannot position the T-mount within .82" from end of panel	???	
Standard Connectors								
	premise_connector	PRM						
	places_hinge	PLC						
Modesty Panel Supports								
	places_modesty_to_cabinet_bracket	PLC						
	places_modesty_to_panel_bracket	PLC						
Posts								
					n/a	NOT IN PHASE I	n/a	NOT IN PHASE I
Upper Posts								
Lower Posts								
Architectural Connections								
Horizontal Supports								
Table Bases								
					1	Must sit on floor		

Relationship Maps (part 10 of 14)

Class Structure	Component Name	Prod Line	Properties	Inherits From	C#	Constraint Relationships	Light Weight Relationships
Brackets				\$D\$312			
	Panel Attached Brackets			\$E\$314			
	premise pedestal to panel bracket	PRM	AF (when used in pairs)				
	premise work surface cantilever	PRM	AF		1	Unable to support 30" deep work surface with only cantilevers	n/a
	premise work surface corner bracket	PRM	AF		1	The long side of the bracket must align to a Panel	n/a
	places included work surface cantilever	PLC			n/a	(i.e. bracket must "clip" to a panel)	n/a
	places work surface cantilever	PLC					
	places work surface corner bracket	PLC					
	places work surface panel mount	PLC					
	places work surface side mount	PLC					
	places work surface slope mount	PLC					
	series 950 credenza file work surface support	PLC			n/a	NOT IN PHASE I	n/a NOT IN PHASE I
	Non-Panel Attached Brackets			\$E\$314		required when cantilever in the way - use in place; provides aft support, credenza provides fore support	
	premise work surface drop mount	PRM					
	premise work surface flush mount	PRM					
	new view cabinet to work surface bracket	PLC			Dep WS	(brought in when NV Upper Cabinet touches a WS)	n/a
	places work surface drop mount	PLC					
	places work surface flush mount	PLC					
	Legs			\$D\$312			
	premise work surface support leg	PRM					
	places work surface support leg	PLC	AF, Acts as Return				
	Worksurface Support Panels			\$D\$312	1	Must sit on floor	
	premise work surface support panel	PRM					
	places conference end support	PLC					
	places work surface end full support panel	PLC					
	places work surface end half support panel	PLC					
	places work surface support panel	PLC					
	Height Adjustment Kits			\$D\$312			
	premise lateral file height adjustment kit	PRM					
	premise pedestal height adjustment kit	PRM					
	premise storage unit height adjustment kit	PRM					
	Adjustable Supports			\$D\$312			
	places height adjustable corner mechanism	PLC					

Relationship Maps (part 11 of 14)

[illegible]

Relationship Maps (part 12 of 14)

Class Structure	Component Name	Prod Line	Properties	Inherits From	Constraint Relationships	L#	Light Weight Relationships
	places switching system receptacle	PLC			n/a NOT IN PHASE I	n/a	NOT IN PHASE I
	places switching system wall switch	PLC			n/a NOT IN PHASE I	n/a	NOT IN PHASE I
	places work surface duplex receptacle	PLC			1 Requires a WS to sit on	1	Goes on top of WS at click x, click z
	places work surface power module	PLC					
Power and Data Routers				\$S3368			
				\$C3388			
Power and Data Channels							
	premise vertical wire manager	PRM			n/a ACCESSORY	n/a	ACCESSORY
	places cable management post	PLC					
	places horizontal wire manager 33in	PLC			n/a ACCESSORY	n/a	ACCESSORY
	places horizontal wire manager 40in	PLC			n/a ACCESSORY	n/a	ACCESSORY
	places variable height cable management post	PLC					
Power and Data Connectors				\$C3368	1 Consumes 1 left- and 1 right-hand power site		
	premise extended power connector	PRM			1 Consumes 1 left- and 1 right-hand power site		
	premise flexible power connector	PRM			1 Consumes 1 left- and 1 right-hand power site		
	premise straight span power connector	PRM			1		
	places base to baseline power connector	PLC					
	places baseline to baseline power connector	PLC					
	places extended power connector	PLC					
	places flexible power connector	PLC					
	places straight power connector	PLC					
Cable Management				\$S3368			
	premise grommet	PRM					
	premise wire management loop	PRM			n/a ACCESSORY	n/a	ACCESSORY
	places cable management bellline cover plate	PLC					
	places cable management ported cover plate	PLC					
	places cable management top cap	PLC					
	places grommet	PLC					
	places wire basket	PLC			n/a ACCESSORY	n/a	ACCESSORY
	places wire management loop	PLC			n/a ACCESSORY	n/a	ACCESSORY
	places wire management module	PLC			n/a ACCESSORY	n/a	ACCESSORY
	places wire manager	PLC			n/a ACCESSORY	n/a	ACCESSORY
	places work surface power module storage	PLC			1 Mounts underneath WS	1	Sits underneath WS at click x, click z
Lighting				\$S3368			
				\$C3410	Requires receptacle within 72 linear inches from the left or right back corner (on the supporting or the left or right back corner (on the supporting or either adjacent panel)	1	
Horizontally Mounted Lighting							
	premise task light	PRM			1 "HML pmm-j"	1	
	premise vertical storage task light bracket	PRM			???		
	places canopy light	PLC			1 Attaches below places canopy	1	
	places counter top task light	PLC			1 "HML pic-cw"	1	
	places freestanding pivot head task light	PLC			1 Requires flat surface to sit on	1	

Relationship Maps (part 13 of 14)

Class Structure	Component Name	Prod Line	Properties	Inherits From	C#	Constraint Relationships	L#	Light Weight Relationships
Vertically Mounted Lighting	places task light	PLC		\$C3418	1 "HML pic-it"			
	places grid hung pivot head task light	PLC			n/a ACCESSORY			ACCESSORY
	places panel hung fluorescent light	PLC			1 "Hang Stuff"			
	places panel hung pivot head task light	PLC			1 "Hang Stuff"			
	places panel mounted fluorescent light	PLC			1 "VNL pic-pmt"			
	places post mount street light	PLC			1 Mounts powered panels >=18" wide, <83" tall			
	places street light	PLC			1 "Mounts on Top of Panel" AND Panel >= 63"			
Floor Mounted Lighting				\$C3418	1 Must sit on floor		1	If nothing selected, put at x_pos = 0, z_pos = click_global, y_rot = 0
Lighting Accessories	places fluorescent light saddle mount kit	PLC		\$C3418	1 Requires appropriate top-cap (wood or metal)		???	
	places painted shelf task light bracket	PLC			1 (Instantiated by premise shelf)		???	
	places vertical storage task light bracket	PLC			???		???	
	places wood shelf task light bracket	PLC			1 (Instantiated by premise shelf)		???	
Organization				\$A33				
Tackable Surfaces	premise tackboard	PRM	N	\$B3437	1 "Tackables"		1	"Hang Stuff"
	places grid tackstrip	PLC	N		n/a ACCESSORY		n/a	ACCESSORY
	places tackboard	PLC	N		1 "Markables"		1	"Hang Stuff"
Markable Surfaces	premise markerboard	PRM	N	\$B3437			1	
	places markerboard	PLC	N				1	
Workflow Devices				\$B3437				
Vertical Workflows	premise all purpose hook	PRM		\$C3445				
	premise lateral file drawer compressor	PRM			n/a ACCESSORY		n/a	ACCESSORY
	premise lateral file drawer divider	PRM			n/a ACCESSORY		n/a	ACCESSORY
	premise lateral file front to back hanging bar	PRM			n/a ACCESSORY		n/a	ACCESSORY
	premise lateral file side to side hanging bar	PRM			n/a ACCESSORY		n/a	ACCESSORY
	premise pedestal drawer divider	PRM			n/a ACCESSORY		n/a	ACCESSORY
	premise shelf divider	PRM			n/a ACCESSORY		n/a	ACCESSORY
	paper management bar	PLC, PRM			n/a ACCESSORY		n/a	ACCESSORY
	paper management freestanding vertical unit	PLC, PRM			n/a ACCESSORY		n/a	ACCESSORY
	paper management suspended vertical unit	PLC, PRM			n/a ACCESSORY		n/a	ACCESSORY
	new views shelf divider	PLC			n/a ACCESSORY		n/a	ACCESSORY
	places all purpose hook	PLC			n/a ACCESSORY		n/a	ACCESSORY
	places fundamental pedestal hanging bar	PLC			n/a ACCESSORY		n/a	ACCESSORY
	places fundamental pedestal side to side divider	PLC			n/a ACCESSORY		n/a	ACCESSORY
	places lateral file front to back hanging bar	PLC			n/a ACCESSORY		n/a	ACCESSORY
	places organization grid	PLC			n/a ACCESSORY		n/a	ACCESSORY

Relationship Maps (part 14 of 14)

Class Structure	Component Name	Prod Line	Properties	Inherits From	CK	Constraint Relationships		Light Weight Relationships	
	places shelf divider	PLC			n/a	ACCESSORY		n/a	ACCESSORY
	places vertical storage unit grid	PLC			n/a	ACCESSORY		n/a	ACCESSORY
	tri mode paper management bar	PLC			n/a	ACCESSORY		n/a	ACCESSORY
	tri mode vertical unit	PLC			n/a	ACCESSORY		n/a	ACCESSORY
	series 950 drawer compressor	PLC			n/a	ACCESSORY		n/a	ACCESSORY
	series 950 drawer divider	PLC			n/a	ACCESSORY		n/a	ACCESSORY
	series 950 front to back hanging bar	PLC			n/a	ACCESSORY		n/a	ACCESSORY
	series 950 side to side hanging bar	PLC			n/a	ACCESSORY		n/a	ACCESSORY
				SC3445					
Horizontal Workflows									
	premises pedestal pencil tray	PRM			n/a	ACCESSORY		n/a	ACCESSORY
	paper management freestanding horizontal unit	PLC, PRM			n/a	ACCESSORY		n/a	ACCESSORY
	paper management suspended horizontal unit	PLC, PRM			n/a	ACCESSORY		n/a	ACCESSORY
	paper management trays	PLC, PRM			n/a	ACCESSORY		n/a	ACCESSORY
	paper management under shelf unit	PLC			n/a	ACCESSORY		n/a	ACCESSORY
	places freestanding grid mailbox	PLC			n/a	ACCESSORY		n/a	ACCESSORY
	places fundamental pedestal tray	PLC			n/a	ACCESSORY		n/a	ACCESSORY
	places grid mailbox	PLC			n/a	ACCESSORY		n/a	ACCESSORY
	places grid reference tray	PLC			n/a	ACCESSORY		n/a	ACCESSORY
	tri mode divider	PLC			n/a	ACCESSORY		n/a	ACCESSORY
	tri mode hanger clip	PLC			n/a	ACCESSORY		n/a	ACCESSORY
	tri mode horizontal shelves	PLC			n/a	ACCESSORY		n/a	ACCESSORY
	tri mode horizontal unit	PLC			n/a	ACCESSORY		n/a	ACCESSORY
				SC3445					
Diagonal Workflows									
	paper management freestanding diagonal unit	PLC, PRM			n/a	ACCESSORY		n/a	ACCESSORY
	paper management suspended diagonal unit	PLC, PRM			n/a	ACCESSORY		n/a	ACCESSORY
	paper management tri mode diagonal unit	PLC			n/a	ACCESSORY		n/a	ACCESSORY
				SC3445					
Workflow Bins									
	places grid diskette bin	PLC			n/a	ACCESSORY		n/a	ACCESSORY
	places grid storage bin	PLC			n/a	ACCESSORY		n/a	ACCESSORY

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Although described with reference to a particular system, the present invention operates on any computer system and can be implemented in software, hardware or any combination thereof. When implemented fully or
5 partially in software, the invention can reside, permanently or temporarily, on any memory or storage medium, including but not limited to a RAM, a ROM, a disk, an ASIC, a PROM and the like.

Thus, a graphical user interface for configuring
10 office furniture is provided. One skilled in the art will appreciate that the present invention can be practiced by other than the described embodiments, which are presented for purposes of illustration and not limitation, and the present invention is limited
15 only by the claims that follow.

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What is claimed:

- 1 1. A method, for use in a user workstation
2 including a pointing device and a visual display unit,
3 for providing a graphical user interface to a computer
4 program for configuring office furniture, the method
5 comprising:
6 displaying on a screen of the visual display unit
7 at the user's workstation questions regarding user
8 configuration criteria;
9 in response to said displaying, obtaining
10 configuration criteria from the user and providing the
11 user configuration criteria to the computer program;
12 displaying in an area on a screen of the visual
13 display unit at the user's workstation a graphical
14 representation of at least one typical furniture
15 configuration satisfying the user configuration
16 criteria;
17 selecting, with the pointing device, a typical
18 furniture configuration from the at least one typical
19 furniture configuration displayed on the screen;
20 modifying, using the pointing device, aspects of
21 the selected typical furniture configuration to produce
22 a modified furniture configuration;

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23 displaying on the visual display unit at the
24 user's workstation a graphical representation of the
25 modified furniture configuration;
26 with the pointing device, selecting a validity
27 checking option to effect checking the validity of the
28 modified furniture configuration; and
29 in response to said selecting the validity
30 checking option, checking the validity of the modified
31 configuration.

1 2. A method as in claim 1 wherein the
2 configuration criteria include at least one of:
3 conferencing criteria;
4 privacy criteria;
5 power criteria;
6 communications criteria;
7 storage criteria; and
8 area criteria.

1 3. A method as in claim 1 wherein the modifying
2 of the selected typical furniture configuration
3 comprises at least one of, for a depicted component of
4 the selected typical furniture configuration:
5 adding another component to the depiction of the
6 selected typical furniture configuration;

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7 deleting the depicted component from the depiction
8 of selected typical furniture configuration;
9 repositioning the depicted component of the
10 depicted selected typical furniture configuration;
11 changing the depicted fabric or finish of the
12 depicted component of the depicted selected typical
13 furniture configuration; and
14 changing the shape or size of the depicted
15 component of the depicted selected typical furniture
16 configuration.

1 4. A method as in claim 3 wherein the adding of
2 another component comprises:
3 on the screen of the visual display unit at the
4 user's workstation, presenting the user with various
5 possible components which can be added; and
6 by the user,
7 selecting with the pointing device one of the
8 various possible components; and
9 on the display depicting the typical
10 furniture configuration, positioning the
11 selected one possible component on the
12 depiction of the current typical furniture
13 configuration.

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1 5. A method as in claim 3 wherein the changing
2 the shape or size of the depicted component comprises,
3 with the pointing device:

4 selecting the depicted component; and
5 adjusting the shape or size of the depicted
6 component, whereby the shape or size can only be
7 adjusted to a valid shape or size.

1 6. A method as in claim 1 further comprising:
2 with the pointing device, selecting a price option
3 to effect determining a price of the modified
4 configuration; and
5 in response to said selecting said price option,
6 determining a price of the modified depicted
7 configuration.

1 7. A method as in claim 1 further comprising:
2 with the pointing device, selecting a cluster
3 option to effect producing a cluster configuration of
4 the modified typical furniture configuration; and
5 in response to said selecting said cluster option,
6 producing a cluster configuration of the modified
7 typical furniture configuration; and
8 displaying on the screen of the visual display
9 unit at the user's workstation a depiction of the
10 cluster configuration.

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1 8. A method as in claim 7 further comprising:
2 with the pointing device, selecting a price option
3 to effect determining a price of the cluster
4 configuration; and
5 in response to said selecting said price option,
6 determining the price of the cluster configuration.

1 9. A method as in claim 7 wherein the producing
2 of a cluster comprises:
3 determining if the cluster configuration is a
4 valid configuration; and
5 optimizing the cluster configuration.

1 10. A method as in claim 1 wherein the checking
2 the validity of the modified configuration comprises
3 optimizing the modified configuration.

1 11. A method as in claims 9 or 10 wherein the
2 optimizing of a configuration comprises at least one
3 of:
4 removing redundant components from the
5 configuration;
6 merging components in the configuration; and
7 splitting components in the configuration.

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1 12. A method as in claim 1 wherein the modifying
2 aspects of the selected typical furniture configuration
3 comprises modifying the entire product line of the
4 configuration.

1 13. A method of configuring office furniture
2 comprising, by computer:
3 obtaining configuration criteria from a user;
4 presenting the user with at least one typical
5 furniture configuration satisfying the criteria;
6 selecting a typical furniture configuration from
7 the at least one typical configuration;
8 modifying aspects of the selected typical
9 furniture configuration to produce a modified furniture
10 configuration;
11 producing a cluster configuration of the modified
12 typical furniture configuration;
13 checking the validity of the cluster
14 configuration; and
15 determining a price of the cluster configuration.

1 14. A method of configuring office furniture
2 comprising, by computer:
3 obtaining configuration criteria from a user;
4 presenting the user with at least one typical
5 furniture configuration satisfying the criteria;

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6 selecting a typical furniture configuration from
7 the at least one typical configuration;
8 modifying aspects of the selected typical
9 furniture configuration to produce a modified
10 configuration; and
11 checking the validity of the modified
12 configuration.

1 15. A method as in claim 14 wherein the
2 configuration criteria include at least one of:
3 conferencing criteria;
4 privacy criteria;
5 power criteria;
6 communications criteria;
7 storage criteria; and
8 area criteria.

1 16. A method as in claim 14 wherein the modifying
2 of the selected typical comprises at least one of, for
3 a component of the selected typical:
4 adding another component to the selected typical
5 furniture configuration;
6 deleting the component from the selected typical
7 furniture configuration;
8 repositioning the component of the selected
9 typical furniture configuration;

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10 changing the fabric or finish of the component of
11 the selected typical furniture configuration; and
12 changing the shape or size of the component of the
13 selected typical furniture configuration.

1 17. A method as in claim 16 wherein the adding of
2 another component comprises:

3 presenting the user with possible components which
4 can be added; and

5 by the user,

6 selecting one of the possible components; and
7 positioning the selected one possible
8 component on the current typical furniture
9 configuration.

1 18. A method as in claim 16 wherein the changing
2 the shape or size of the component comprises:

3 selecting the component; and

4 adjusting the shape or size of the component,
5 whereby the shape or size can only be adjusted to a
6 valid shape or size.

1 19. A method as in claim 14 further comprising:
2 determining a price of the modified furniture
3 configuration.

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1 20. A method as in claim 14 further comprising:
2 producing a cluster configuration of the modified
3 typical furniture configuration.

1 21. A method as in claim 20 further comprising:
2 determining a price of the cluster configuration.

1 22. A method as in claim 20 wherein the producing
2 of a cluster comprises:
3 determining if the cluster configuration is a
4 valid configuration;
5 optimizing the cluster configuration.

1 23. A method as in claim 14 wherein the
2 checking the validity of the modified furniture
3 configuration comprises
4 optimizing the modified furniture configuration.

1 24. A method as in any one of claims 22 and 23
2 wherein the optimizing of a configuration comprises at
3 least one of:
4 removing redundant components from the
5 configuration;
6 merging components in the configuration; and
7 splitting components in the configuration.

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1 25. A method as in claim 14 wherein the modifying
2 aspects of the selected typical comprises modifying the
3 entire product line of the configuration.

1 26. Computer-readable media tangibly embodying an
2 interface program of instructions executable by the
3 machine to provide a graphical user interface to a
4 computer program for configuring office furniture, the
5 interface program comprising code to effect:

6 displaying on a screen of a visual display unit at
7 a user's workstation questions regarding user
8 configuration criteria;

9 in response to said displaying, obtaining
10 configuration criteria from the user;

11 displaying in an area on a screen of the visual
12 display unit at the user's workstation a graphical
13 representation of at least one typical furniture
14 configuration satisfying the criteria;

15 selecting, with input from the pointing device, a
16 typical furniture configuration from the at least one
17 typical furniture configurations displayed on the
18 screen;

19 modifying, using input from the pointing device,
20 aspects of the selected typical furniture configuration
21 to produce a modified furniture configuration;

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22 displaying on the visual display unit at the
23 user's workstation a graphical representation of the
24 modified furniture configuration;
25 with input from the pointing device, selecting a
26 validity checking option to effect checking the
27 validity of the modified furniture configuration; and
28 in response to said selecting the validity
29 checking option, checking the validity of the modified
30 furniture configuration.

1 27. Media as in claim 26 wherein the
2 configuration criteria include at least one of:
3 conferencing criteria;
4 privacy criteria;
5 power criteria;
6 communications criteria;
7 storage criteria; and
8 area criteria.

1 28. Media as in claim 26 wherein the modifying of
2 the selected typical comprises at least one of, for a
3 depicted component of the selected typical furniture
4 configuration:
5 adding another component to the depiction of the
6 selected typical furniture configuration;

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7 deleting the depicted component from the depiction
8 of selected typical furniture configuration;
9 repositioning the depicted component of the
10 depicted selected typical furniture configuration;
11 changing the depicted fabric or finish of the
12 depicted component of the depicted selected typical
13 furniture configuration; and
14 changing the shape or size of the depicted
15 component of the depicted selected typical furniture
16 configuration.

1 29. Media as in claim 28 wherein the adding of
2 another component comprises:

3 on the screen of the visual display unit at the
4 user's workstation, presenting the user with various
5 possible components which can be added; and

6 by the user,

7 selecting with the pointing device one of the
8 various possible components; and
9 on the display depicting the typical
10 furniture configuration, positioning the
11 selected one possible component on the
12 depiction of the current typical furniture
13 configuration.

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1 30. Media as in claim 28 wherein the changing the
2 shape or size of the depicted component comprises, with
3 input from the pointing device:

4 selecting the depicted component; and
5 adjusting the shape or size of the depicted
6 component, whereby the shape or size can only be
7 adjusted to a valid shape or size.

1 31. Media as in claim 26 the program further
2 comprising code to effect:

3 with input from the pointing device, selecting a
4 price option to effect determining a price of the
5 modified configuration; and

6 in response to said selecting said price option,
7 determining a price of the modified depicted
8 configuration.

1 32. Media as in claim 26 the program further
2 comprising code to effect:

3 with input from the pointing device, selecting a
4 cluster option to effect producing a cluster
5 configuration of the modified typical furniture
6 configuration;

7 in response to said selecting said cluster option,
8 producing a cluster configuration of the modified
9 typical furniture configuration; and

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10 displaying on the screen of the visual display
11 unit at the user's workstation a depiction of the
12 cluster configuration.

1 33. Media as in claim 32, the program further
2 comprising code to effect:
3 with input from the pointing device, selecting a
4 price option to effect determining a price of the
5 modified configuration; and
6 in response to said selecting said price option,
7 determining the price of the cluster configuration.

1 34. Media as in claim 32 wherein the producing of
2 a cluster comprises:
3 determining if the cluster configuration is a
4 valid furniture configuration; and
5 optimizing the cluster configuration.

1 35. Media as in claim 26 wherein the checking the
2 validity of the modified configuration comprises
3 optimizing the modified configuration.

1 36. Media as in claim 35 wherein the optimizing
2 of a configuration comprises at least one of:
3 removing redundant components from the
4 configuration;

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5 merging components in the configuration; and
6 splitting components in the configuration.

1 37. Media as in claim 34 wherein the optimizing
2 of a configuration comprises at least one of:
3 removing redundant components from the
4 configuration;
5 merging components in the configuration; and
6 splitting components in the configuration.

1 38. Media as in claim 26 wherein the modifying
2 aspects of the selected typical comprises modifying the
3 entire product line of the configuration.

1 39. Computer-readable media as in any one of
2 claims 26 to 38 wherein said media comprise at least
3 one of a RAM, a ROM, a disk, an ASIC and a PROM.

1 40. A computer-assisted furniture configuration
2 system comprising:
3 (A) a visual display unit;
4 (B) a pointing device; and
5 (C) interface means for providing a graphical
6 user interface to said configuration system, the
7 interface means comprising means to effect:

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8 displaying on a screen of the visual display unit
9 at the user's workstation questions regarding user
10 configuration criteria;

11 in response to said displaying, obtaining
12 configuration criteria from the user and providing the
13 user configuration criteria to the computer program;

14 displaying in an area on a screen of the visual
15 display unit at the user's workstation a graphical
16 representation of at least one typical furniture
17 configuration satisfying the user configuration
18 criteria;

19 selecting, with the pointing device, a typical
20 furniture configuration from the at least one typical
21 furniture configurations displayed on the screen;

22 modifying, using the pointing device, aspects of
23 the selected typical furniture configuration to produce
24 a modified furniture configuration;

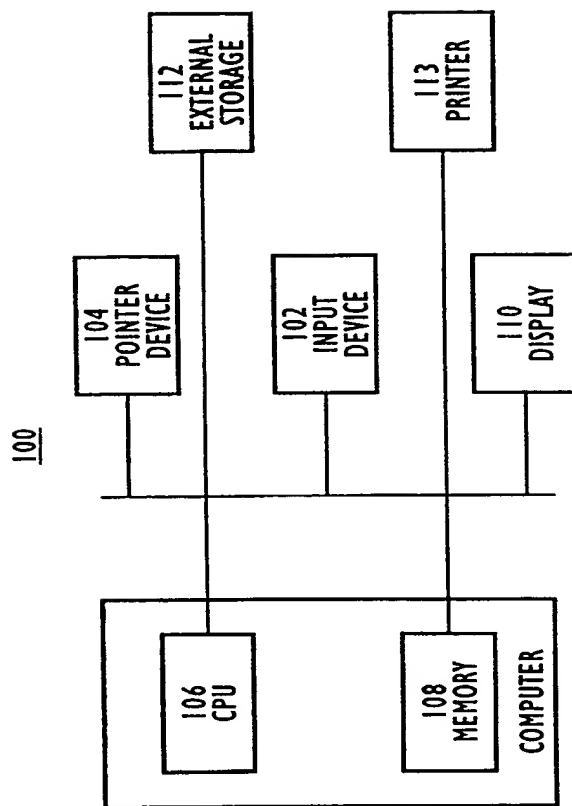
25 displaying on the visual display unit at the
26 user's workstation a graphical representation of the
27 modified furniture configuration;

28 with the pointing device, selecting a validity
29 checking option to effect checking the validity of the
30 modified furniture configuration; and

31 in response to said selecting the validity
32 checking option, checking the validity of the modified
33 configuration.

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FIG. 1



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FIG. 2

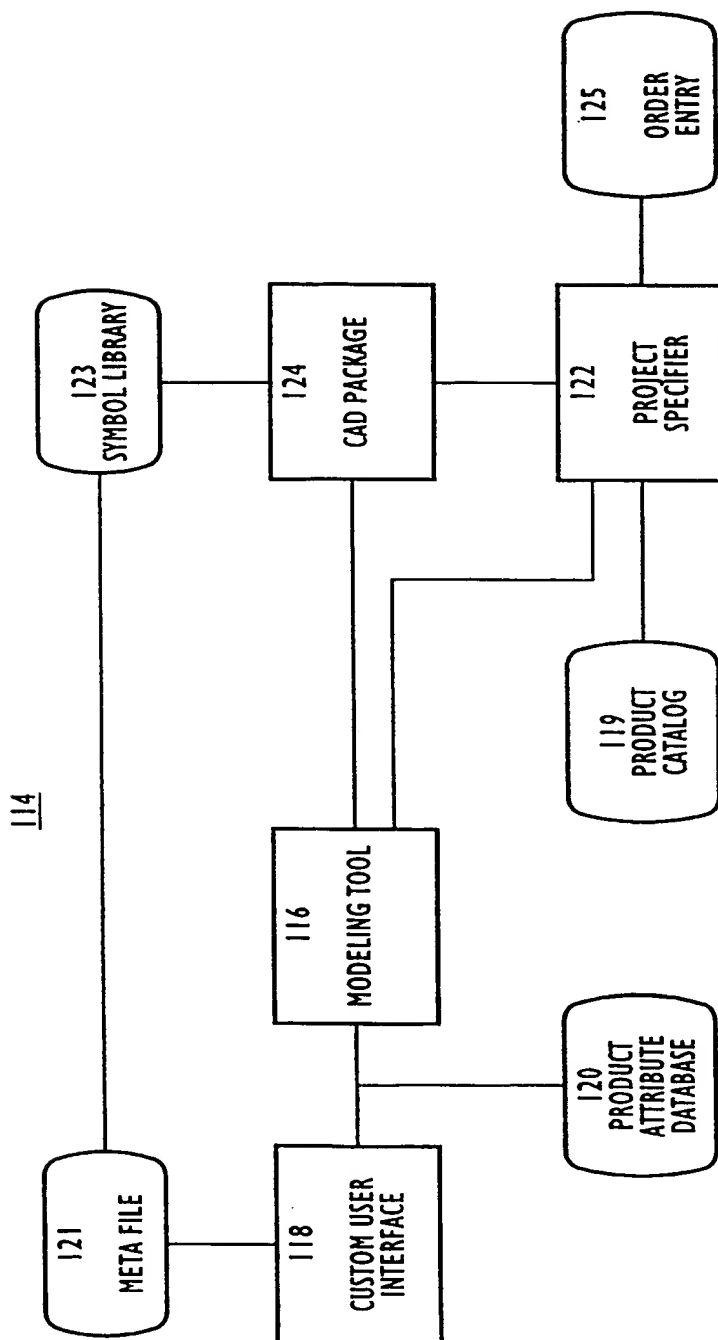
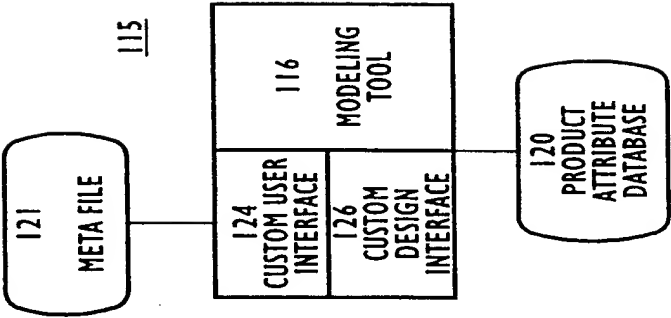
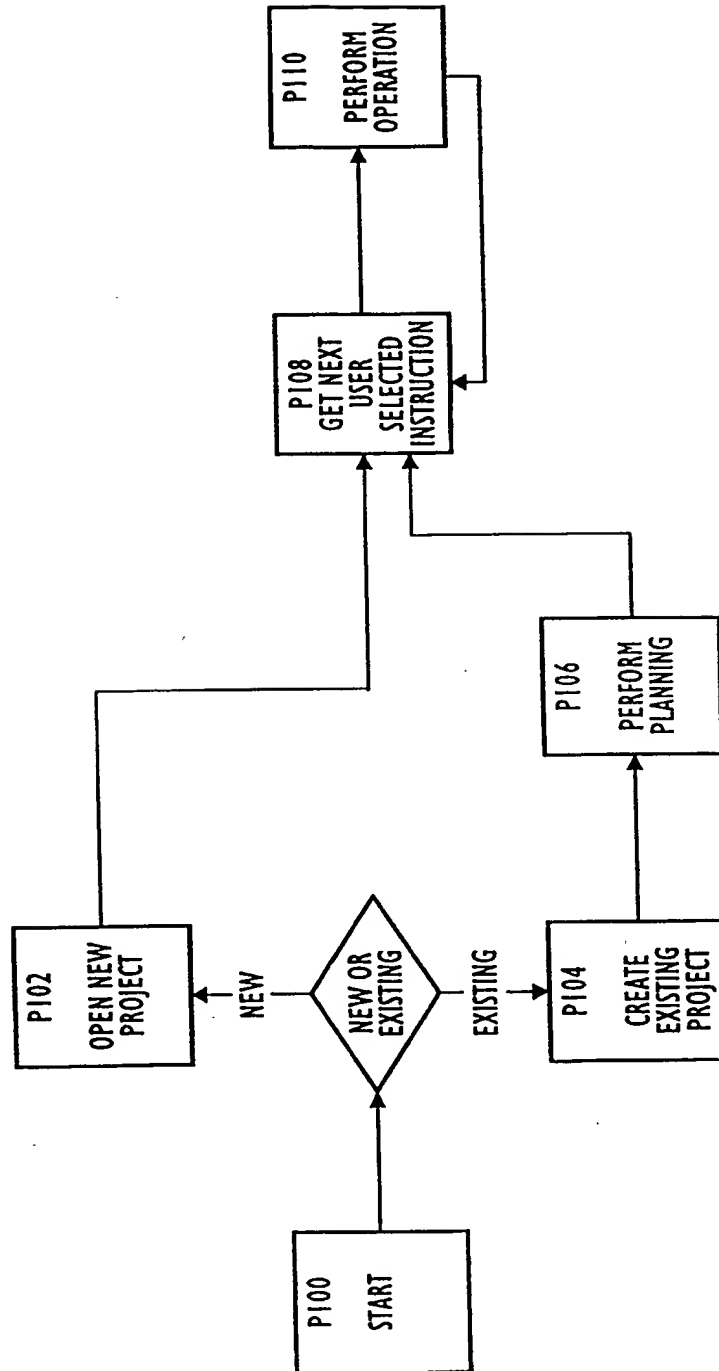


FIG. 3



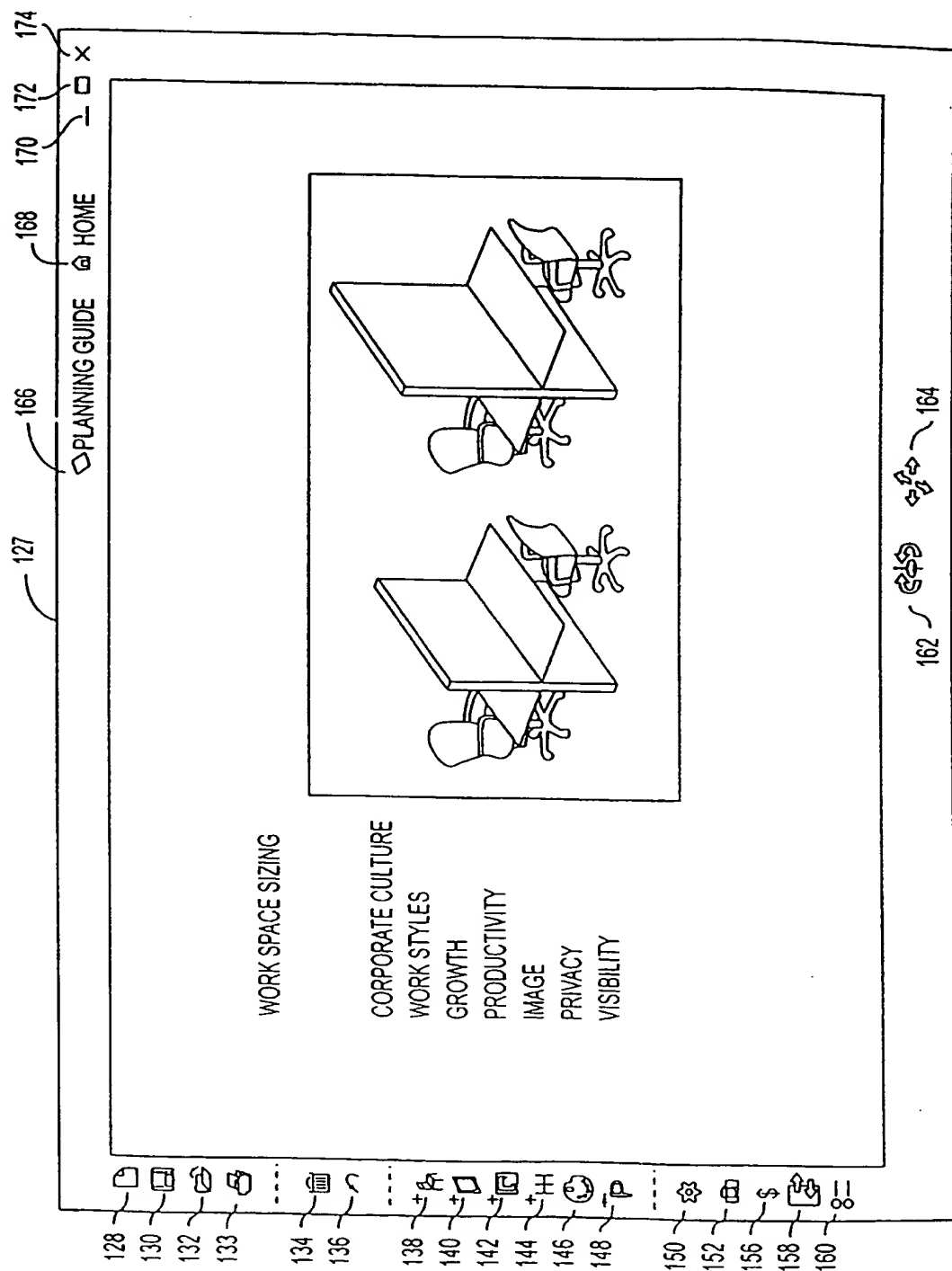
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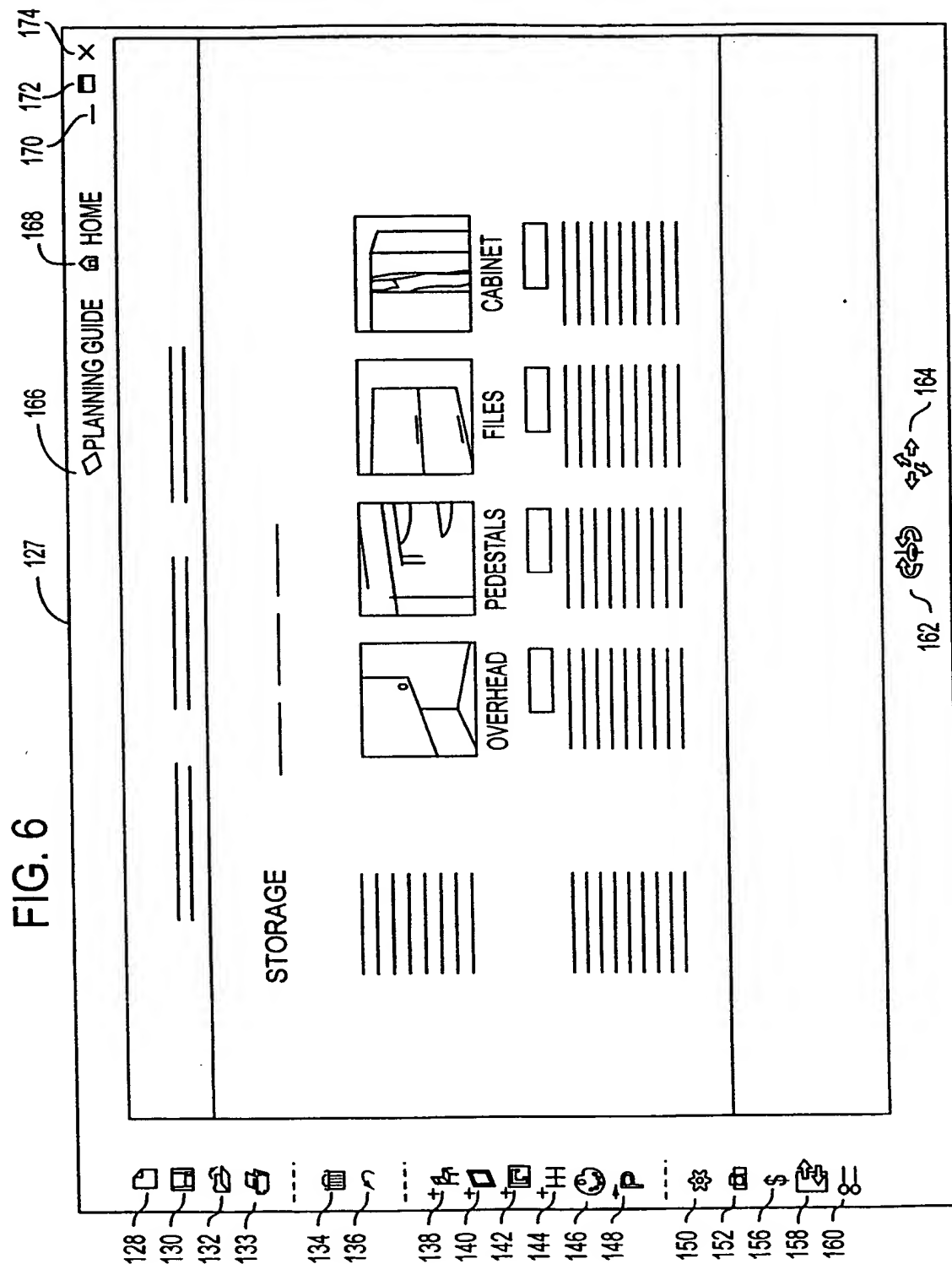
FIG. 4



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FIG. 5





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FIG. 7

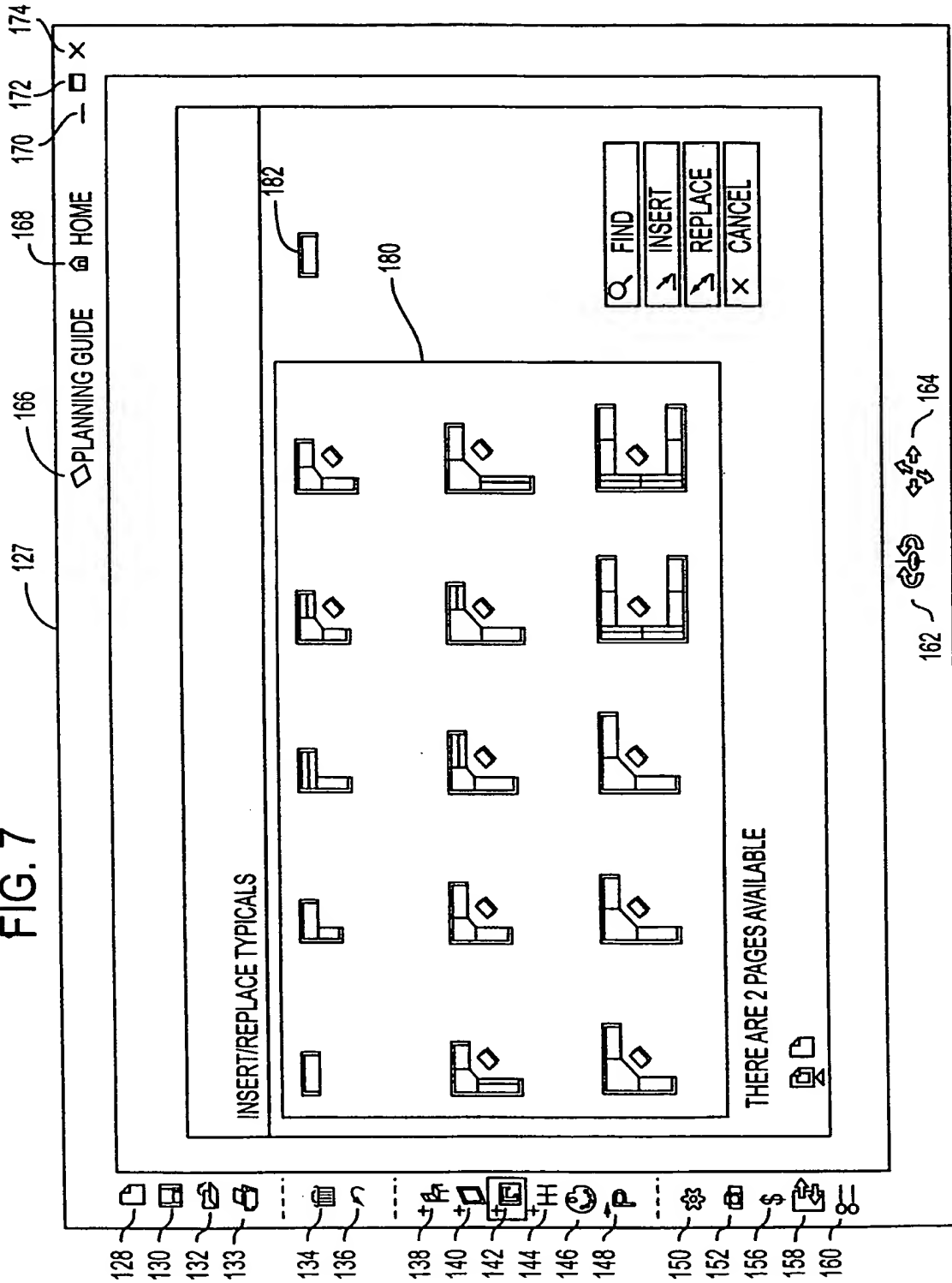
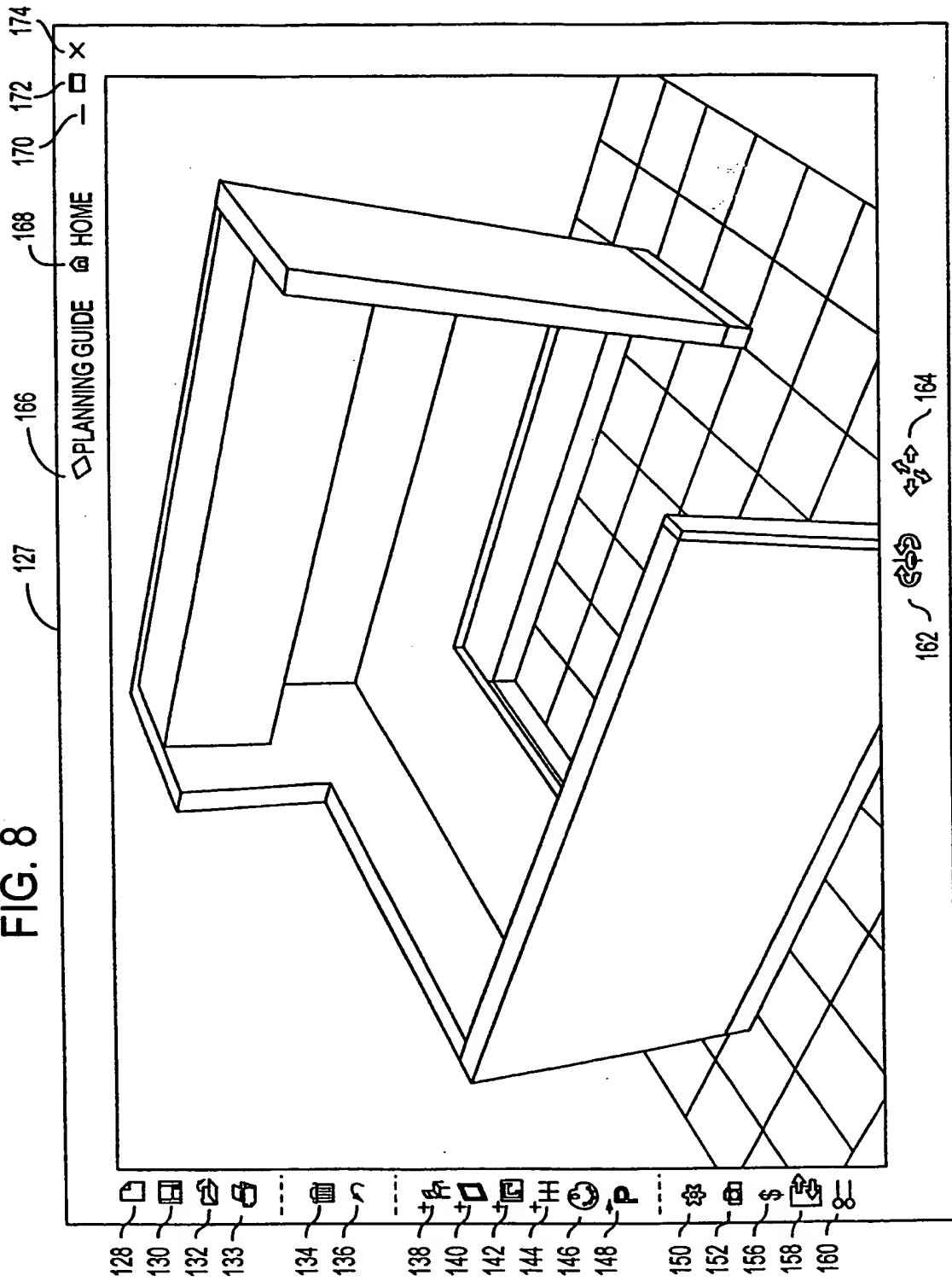
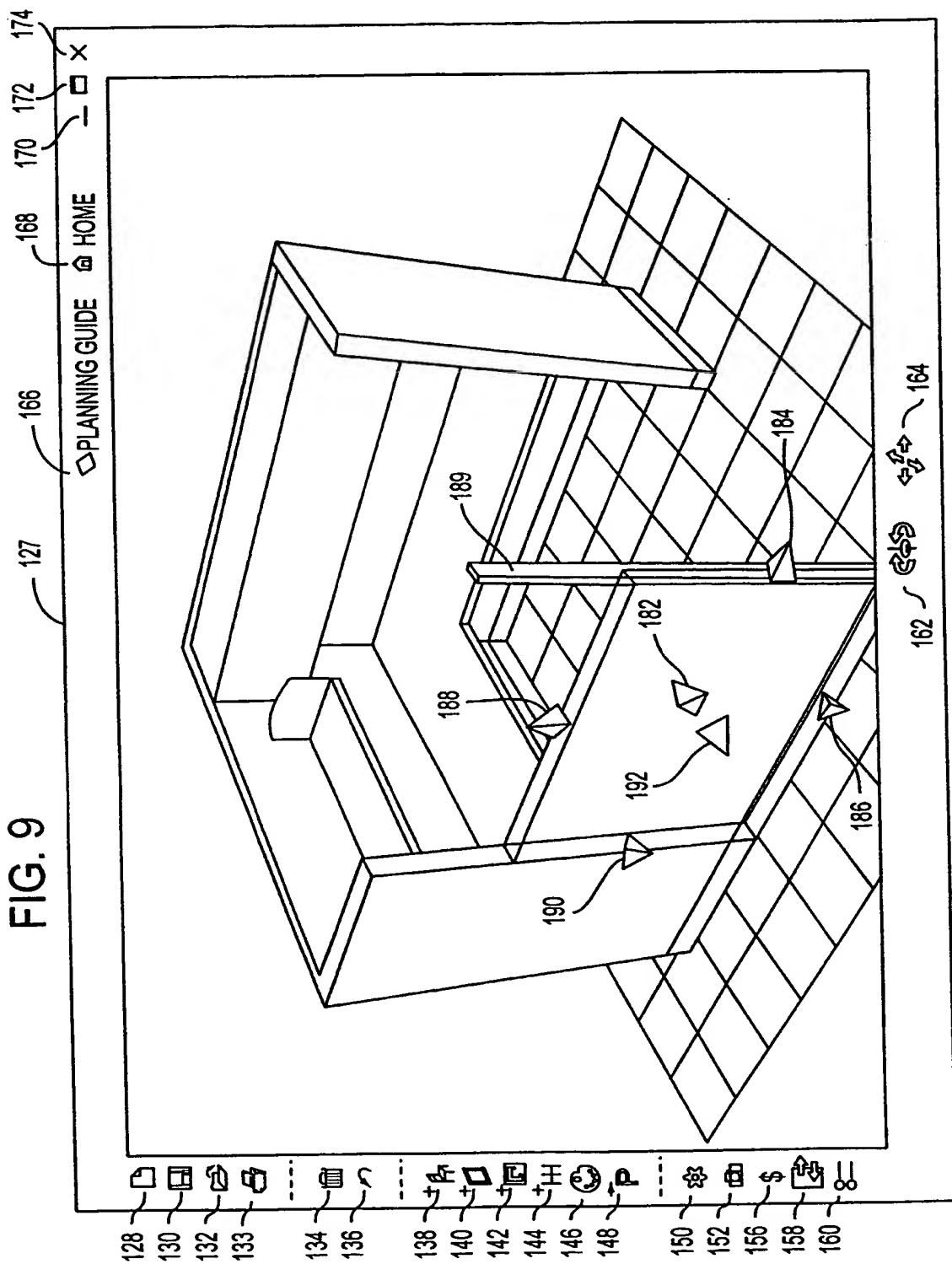


FIG. 8



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FIG. 9



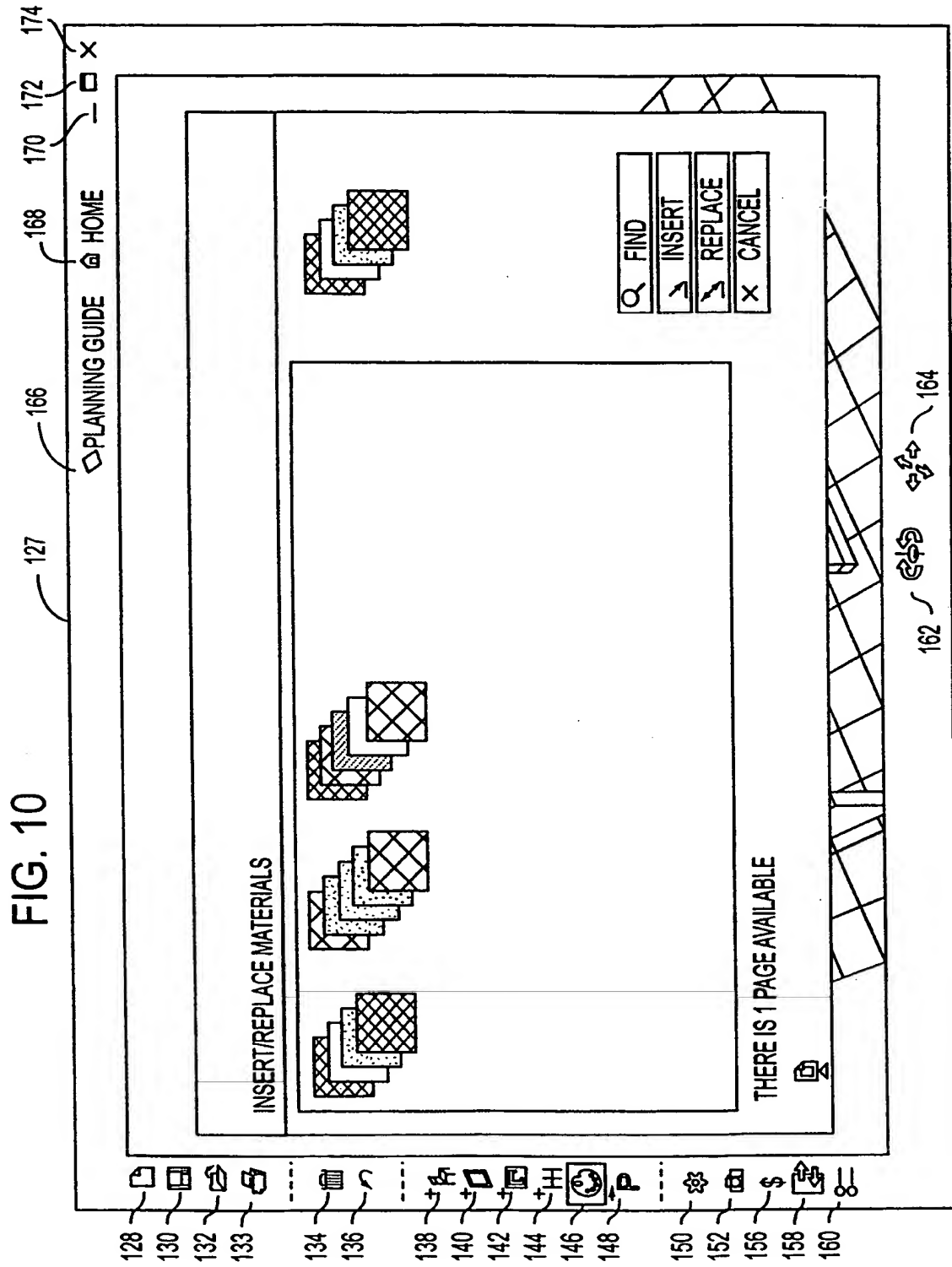


FIG. 11

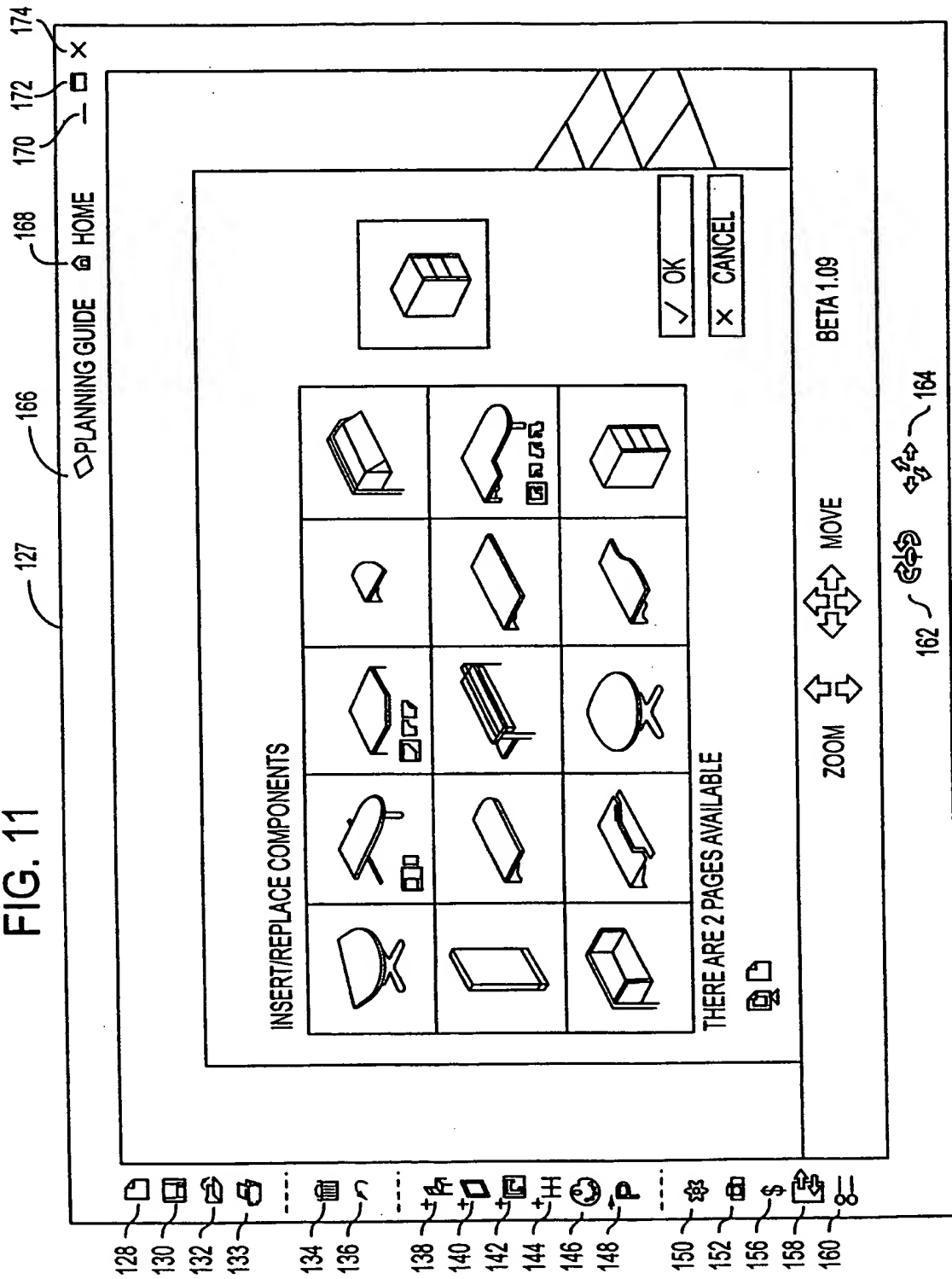


FIG. 12

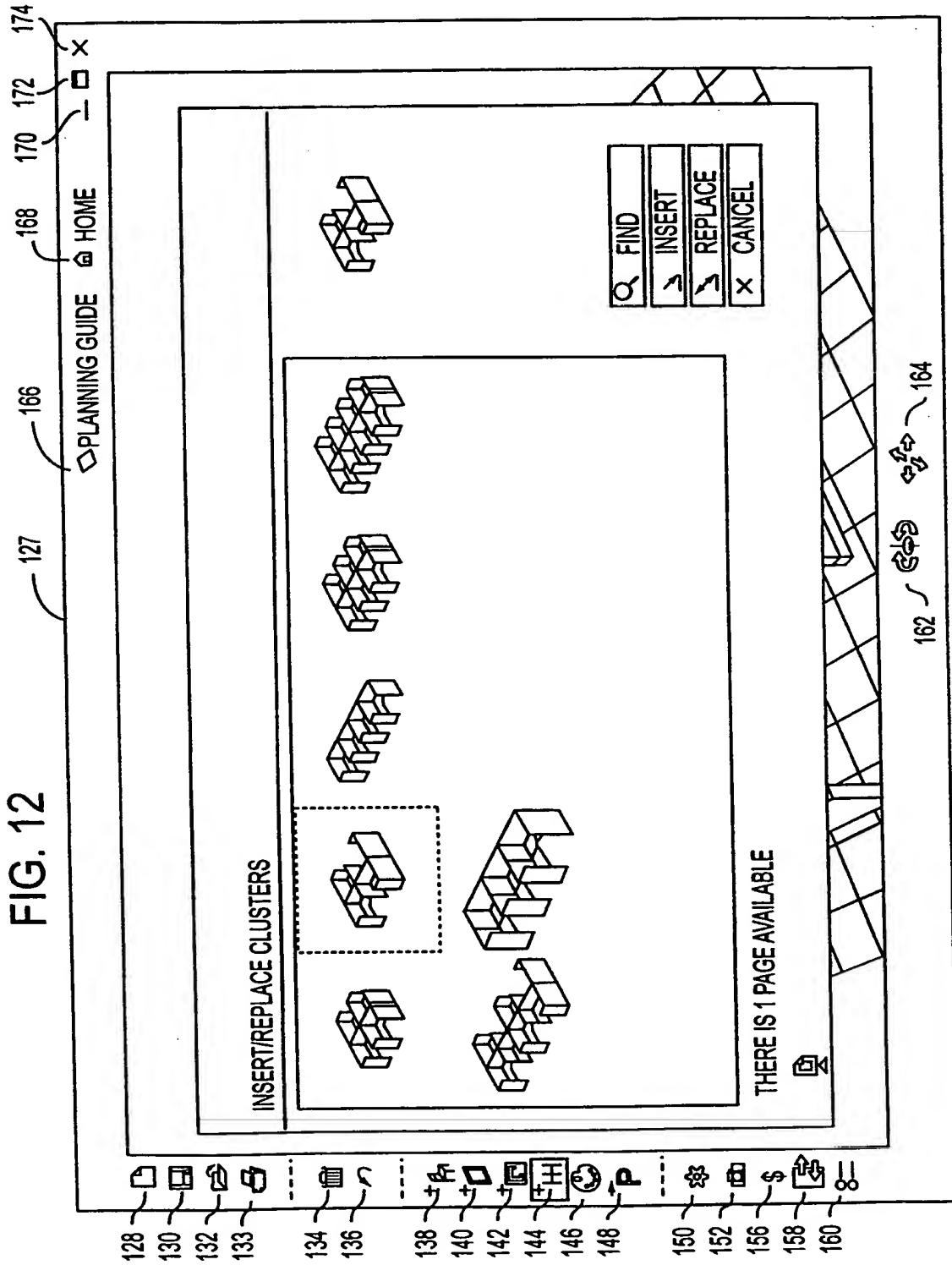


FIG. 13

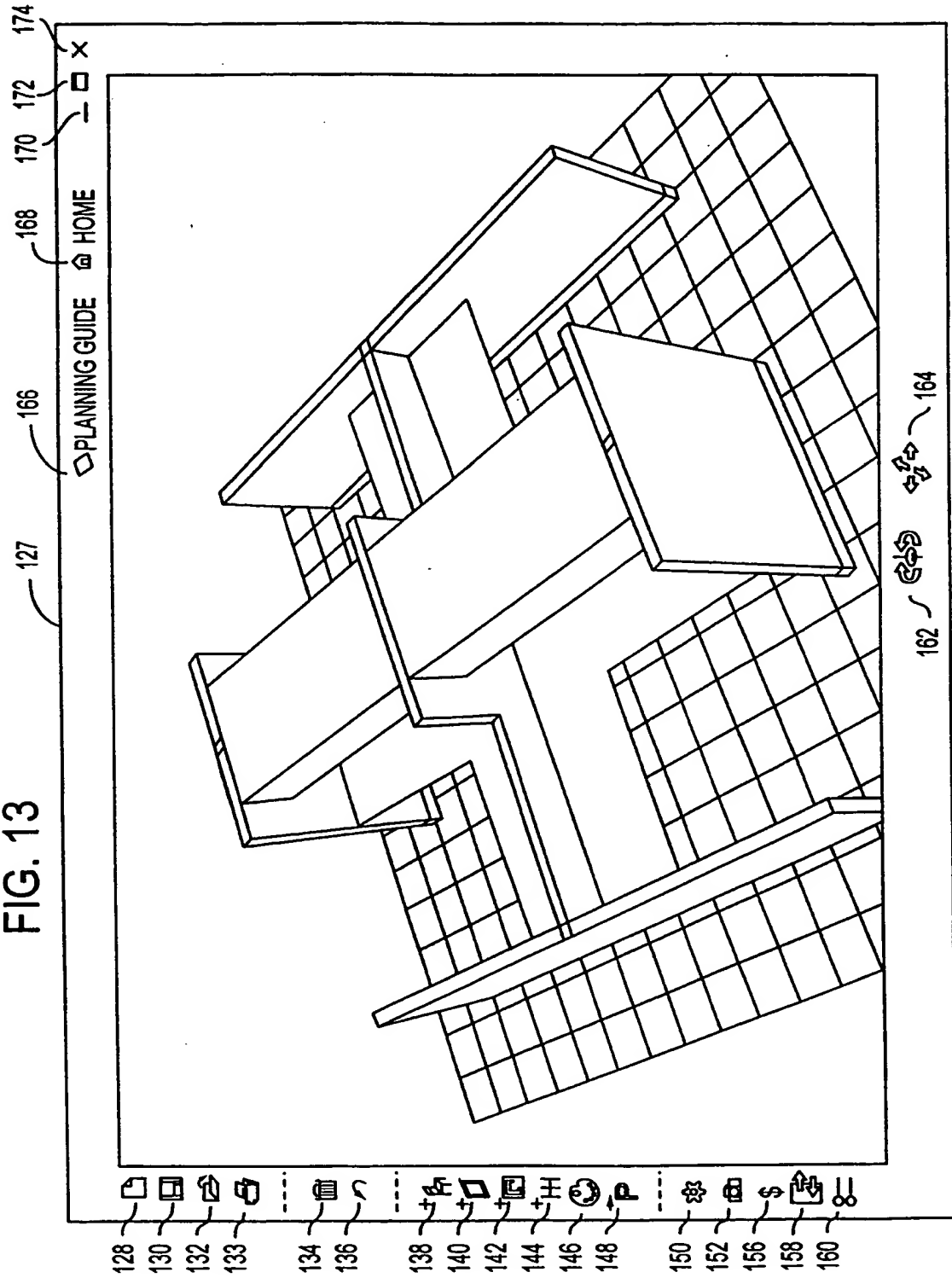
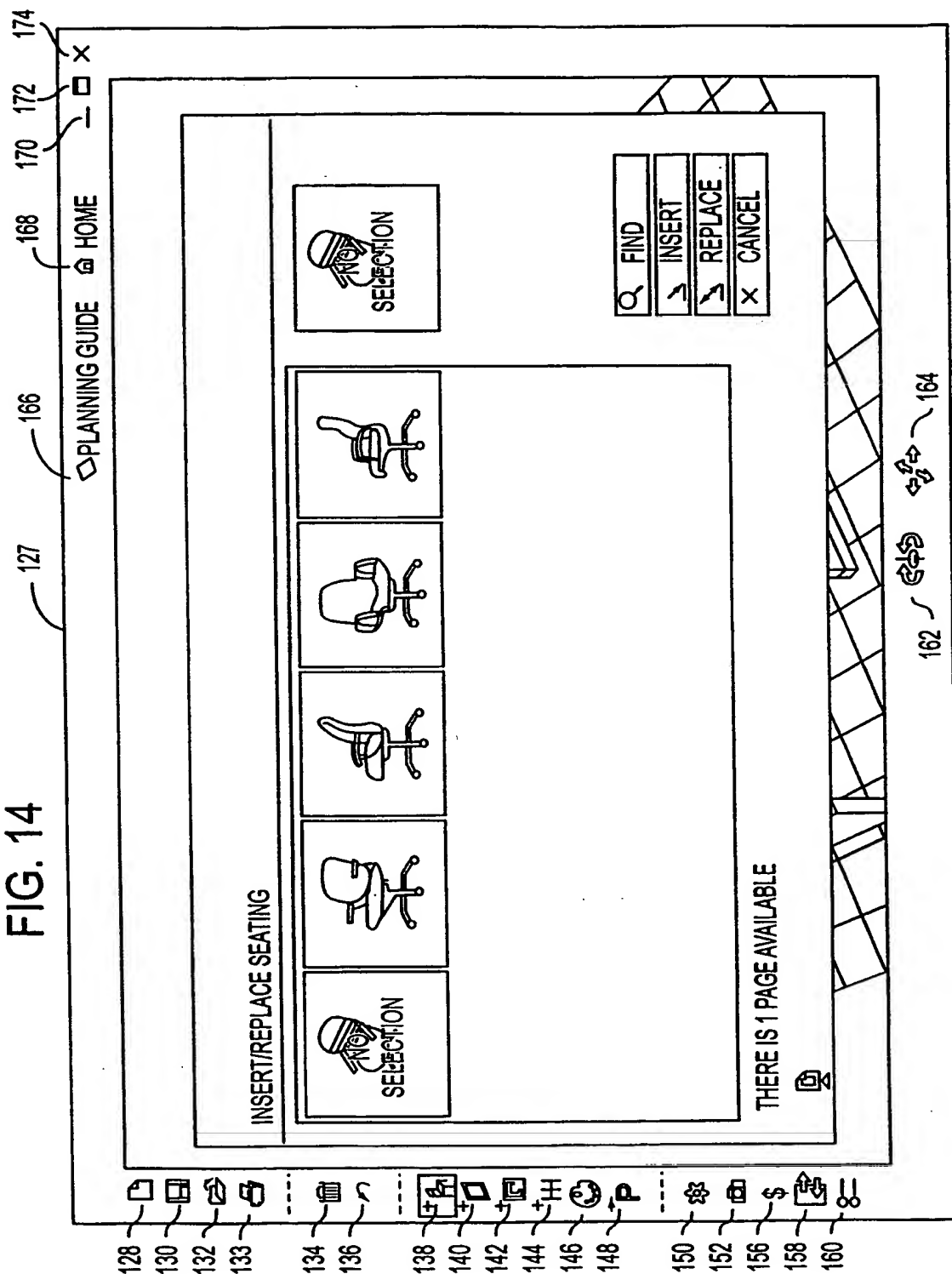


FIG. 14



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FIG. 15

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PLANNING GUIDE
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QUOTE BILL OF MATERIALS

COMPONENT	SIZE	QTY	BASE PART NU...	LIST	DISC.	EXT. \$	DEALER%	COST	MARGIN\$	MARG%
CURRENT PROJECT										
<input checked="" type="checkbox"/> PANEL	64x24	3	NPFW-6424-PF...	\$508.00	0%	\$1524.00	40%	\$609.60	\$914.40	250%
<input checked="" type="checkbox"/> PANEL	64x36	2	NPFW-6436-PF...	\$611.00	0%	\$1222.00	40%	\$488.80	\$733.20	250%
<input checked="" type="checkbox"/> PANEL	64x48	2	NPFW-6448-PF...	\$702.00	0%	\$1404.00	40%	\$561.60	\$842.40	250%
<input checked="" type="checkbox"/> FJ-OAH										
<input checked="" type="checkbox"/> FE-OC7										
<input checked="" type="checkbox"/> TR-00E										
<input checked="" type="checkbox"/> VP-00N										
<input checked="" type="checkbox"/> BRACKET	0	4	NSC-1,TR-00K	\$37.00	0%	\$148.00	40%	\$59.20	\$88.80	250%
<input checked="" type="checkbox"/> BRACKET	0	2	NUDS-15,TR-00R	\$37.00	0%	\$74.00	40%	\$29.60	\$44.40	250%
<input checked="" type="checkbox"/> BRACKET	0	1	NUSS-10,TR-00R	\$37.00	0%	\$37.00	40%	\$14.80	\$22.20	250%
<input checked="" type="checkbox"/> CONNECTOR	64	3	NV2W-64-F,TR-	\$161.00	0%	\$483.00	40%	\$193.20	\$289.80	250%
<input checked="" type="checkbox"/> COVER	64	2	NVEW-64-F,TR-	\$82.00	0%	\$164.00	40%	\$65.60	\$98.40	250%
<input checked="" type="checkbox"/> CONNECTOR	64	3	NVSS-64	\$35.00	0%	\$105.00	40%	\$42.00	\$63.00	250%
<input checked="" type="checkbox"/> WORK SURFACE	24x48	1	NWRW-2448,VP...	\$452.00	0%	\$452.00	40%	\$180.80	\$271.20	250%
<input checked="" type="checkbox"/> VP-00N										
<input checked="" type="checkbox"/> WORK SURFACE	24x72	1	NWRW-2472,VP	\$576.00	0%	\$576.00	40%	\$230.40	\$345.60	250%

TOTALS

DEALER COST % 40 \$2,475.60

DEALER MARGIN 0 \$2,475.60

QUOTE TOTAL \$0.00

OK X CANCEL

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SUBSTITUTE SHEET (RULE 26)

INTERNATIONAL SEARCH REPORT

Int. J. Application No

PCT/US 98/09890

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 G06F17/50 G06T17/40 G06F17/60

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 G06F G06T

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 111 392 A (MALIN STUART B) 5 May 1992 see abstract; claims 1-9 see column 3, line 1 - line 17 see column 1, line 52 - column 2, line 34 see column 3, line 39 - line 60; figure 4 see column 5, line 10 - line 33; figures 1,9	1-40
X	US 5 293 479 A (SMITH JIM ET AL) 8 March 1994 see abstract see column 2, line 7 - line 44 see column 3, line 21 - line 28 see column 9, line 37 - column 10, line 15; figure 1	1,13,14, 26,40

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

13 August 1998

Date of mailing of the international search report

20/08/1998

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Authorized officer

Suendermann, R

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 98/09890

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5111392 A	05-05-1992	NONE	
US 5293479 A	08-03-1994	AU 2309792 A	11-02-1993
		CA 2112977 A	21-01-1993
		EP 0598748 A	01-06-1994
		WO 9301557 A	21-01-1993